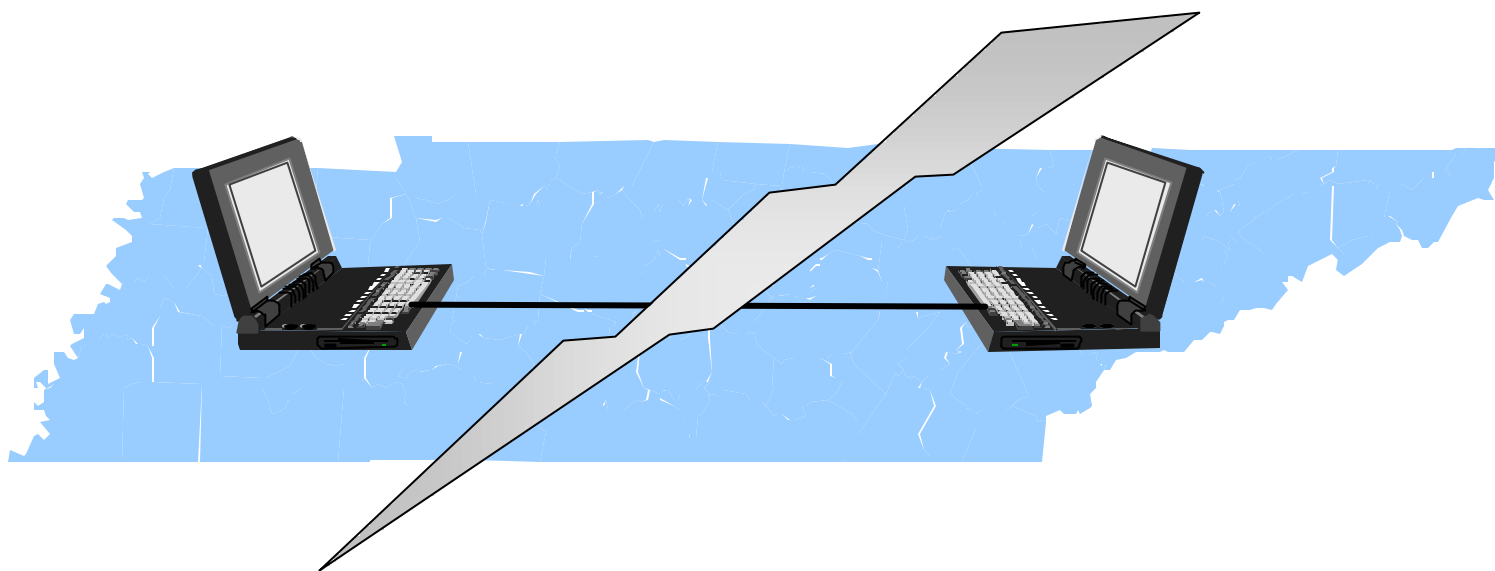


TENNESSEE'S "DIGITAL DIVIDE"



**PREPARED BY:
THE TENNESSEE REGULATORY AUTHORITY
MAY 2000**

*Melvin Malone, Chairman
Lynn Greer, Director
Sara Kyle, Director*

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Executive Summary

The Chairman of the Federal Reserve, Alan Greenspan recently commented that “the United States is currently confronting what can best be described as another industrial revolution. The rapid acceleration of computer and telecommunications technologies is a major reason for the appreciable increase in our productivity in this expansion, and it is likely to continue to be a significant force in expanding standards of living into the twenty-first century.”¹

Tennessee, along with the rest of the nation, is experiencing unprecedented prosperity from this information age. Although computer ownership in Tennessee has doubled since 1994, more than half of Tennessee's population still does not have access to all the tools needed to participate in this technology revolution, including personal computers and computer networking capability such as Internet access.² This disparity between those with access to the tools of technology and those without such access has created what is being referred to as the “digital divide.”

The National Telecommunications and Information Administration (NTIA), a branch of the United States Department of Commerce, has conducted three comprehensive studies since 1994 on computer ownership and access to information services such as the Internet. The NTIA's latest digital divide report, *Falling Through the Net: Defining the Digital Divide*, found that overall “the number of Americans connected to the nation's information infrastructure is soaring. Nevertheless, this year's report finds that a digital divide still exists, and, in many cases, is actually widening over time. Minorities, low-income persons, the less educated, and children of single-parent households, particularly when they reside in rural areas or central cities, are among the groups that lack access to information resources.”³

¹ *Speech to the Charlotte (N.C.) Chamber of Commerce, July 10, 1998.*

² *Basic telephone service is also necessary to access the information superhighway. However, as reported in Chapter 3(f), 94.1% of Tennessee's households subscribe to basic telephone service.*

³ *Falling Through the Net: Defining the Digital Divide, NTIA, July 1999.*

In light of these national studies, the Tennessee Regulatory Authority (TRA) set out to determine how Tennessee fares in access to these technology tools. Using the responses of more than 900 Tennessee households to the Census Bureau's December 1998, *Current Population Survey*, the TRA compiled numerous statistics on trends in computer ownership and Internet access specifically for Tennessee. These statistics include an analysis of computer ownership related to numerous demographic categories, including household income, race, and geography, education and family make-up.

Our analysis finds that Tennessee's digital divide is even more prevalent than the national divide. Although computer ownership in Tennessee has doubled since 1994, still only 37.5% of Tennesseans own a computer and even fewer have access to the Internet. Computer penetration in Tennessee is 11% below the national average, ranking Tennessee 40th among the states in this category.

Of even greater concern is the fact that computer penetration in Tennessee is growing at a slower rate than the nation as a whole and that access to these tools of technology is split among various demographic groups. For example, the most glaring demographic discrepancy is the ever-widening income divide. Despite declining computer prices, the gap in computer ownership between Tennessee households with annual incomes greater than \$75,000 and households with annual incomes of \$15,000 or less **increased** by 13% between 1997 and 1998. Similar divides were found within Tennessee's racial, education, geographic and family make-up demographics.

Other findings of *Tennessee's Digital Divide* include:

- Southern states lag behind other regions of the nation in computer ownership and access to the Internet. According to NTIA statistics, nine of the bottom ten states in computer ownership are Southern states. Computer penetration in rural Southern households is particularly low; 16% lower than the national average. Only inner cities in the Northeast have a lower penetration than the rural South.
- Tennessee households earning more than \$75,000 annually are **four** times more likely to own a computer than a Tennessee household earning \$15,000 or less, and **three** times more likely to own a computer than a household earning between \$15,000 and \$35,000

annually. Also, lower income persons are less likely to have access to the Internet at their place of employment.

- Caucasian households in Tennessee are twice as likely to own a computer than Tennessee's African-American households. The gap in computer ownership between African-American households and Caucasian households is now 20% greater than in 1997.
- According to the NTIA, there is no discernible difference in computer penetration between Caucasian households and African-American households earning more than \$75,000 annually. This suggests that the most affluent families, irrespective of race, are utilizing information resources.
- Only one-third of Tennessee's rural residents own computers. Computer penetration in urban areas exceeds rural areas in every income category. However, Tennessee's geographic divide between urban and rural consumers appears to be dwindling. From 1997 to 1998, the gap in computer ownership between Tennessee's urban and rural households **decreased** by 20%.
- The gap between inner city households and other urban households **increased** 28% between 1997 and 1998.
- Two parent households in Tennessee are **twice** as likely to own a computer than single parent households.

Chapter 3 expands on these findings.

Why is computer ownership and access to information services so important? Many experts believe that computer literacy has become the fourth pillar to the traditional three tenets of education: reading, writing, and arithmetic, and that a failure to acquire the now requisite technical knowledge will prevent large segments of our population from realizing the fruits of the Information Age. Scan the employment section of any major U.S. city newspaper and you will likely find columns upon columns of job listings devoted to companies in search of individuals skilled in the use of computers. Demand for the computer literate is increasing at a rapid pace. So rapid that the Information Technology Association of America estimates that some 400,000 information technology jobs are unfilled

because of a dearth of computer proficient workers, while the NTIA estimates that by the year 2001 at least 60% of all jobs will require computer skills.

What is the solution? At least three distinct initiatives aimed at bridging the digital divide have emerged. First, government regulators and policy makers are establishing and must continue to establish and implement pro-competitive policies that will encourage the widespread deployment of advanced technologies in both the computer and telecommunications industries. To fulfill this objective, governments must build innovative relationships with public utilities and other private companies conducive to promoting pervasive voice, data, and video communications services that can benefit citizens and businesses as well as increase public involvement in government.

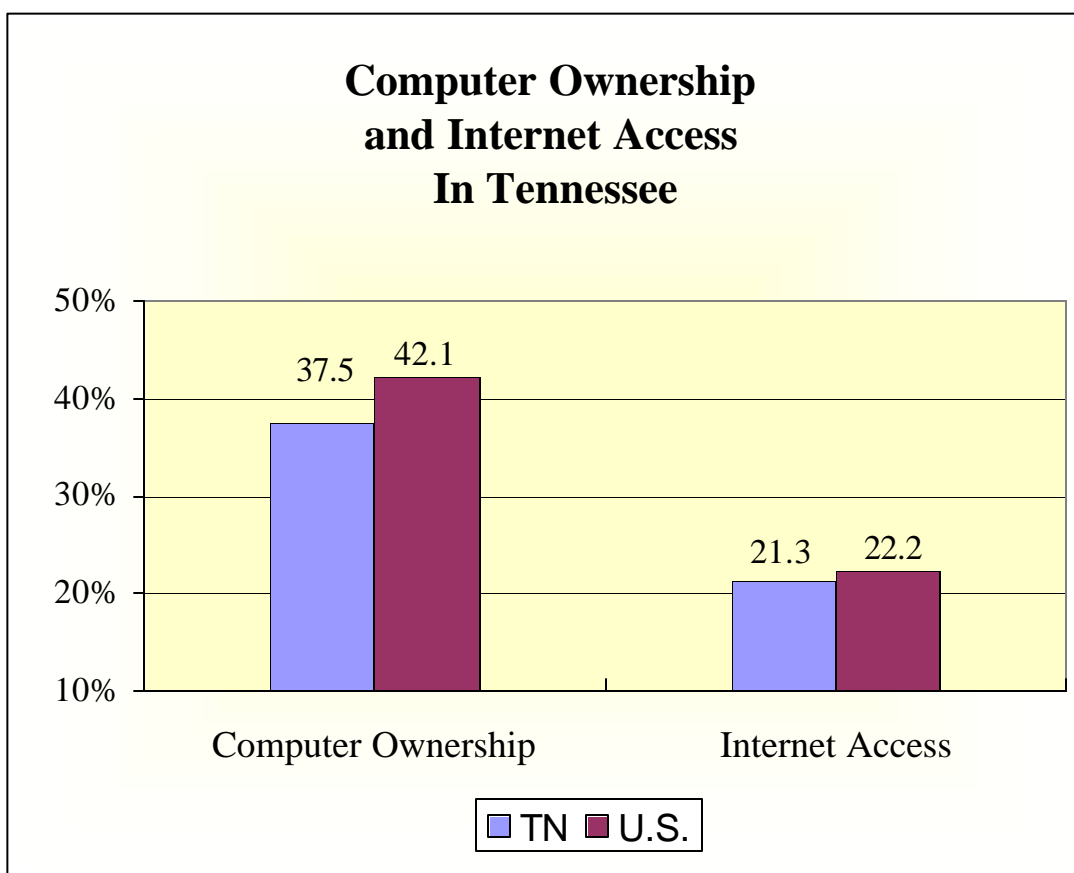
Second, public access points are fundamental for helping connect some of the most technologically under-served populations. The NTIA reports that households with annual incomes of less than \$20,000 and African-American households are twice as likely to gain Internet access through a public library or community center than are households earning more than \$20,000 annually or Caucasian households. Public access to computers and the Internet will play a role similar to that which public payphones did in providing telephone access to those who for various reasons did not have a telephone in their home.

The final initiative is to draw on the resources of the private sector, and many private companies have expressed a willingness to become involved in this important initiative. The major corporations that have entered into partnerships with the public sector to further technology accessibility include: 3Com, Ameritech, Apple Computer, AT&T, AOL, BellSouth, Cisco, Dell Computer, IBM, Intel, MCI/WorldCom, Microsoft, and SBC. One such partnership discussed in Chapter 5 is *PowerUp*, led by Gateway Computer, which is comprised of more than a dozen nonprofit organizations, government agencies and major corporations. The *PowerUp* team has joined together to launch a major multimillion-dollar initiative to help ensure that America's under-served youth acquire the skills, experience, and resources they need to succeed in the digital age.

Local communities have also conducted trials to place computers into the homes of low-income families. One of the most successful trials is occurring in Minnesota where two school districts have joined together to provide laptop computers, family-based training, and technical support to a hundred low-income fourth graders. Parents and teachers reported that the grades and schoolwork of these

students have improved, that the children read more, and that their self-esteem is higher. Coordinators of the program also concluded that the parents have benefited greatly by enhancing their job skills through the family-based training.

In conclusion, *Tennessee's Digital Divide* clearly demonstrates that a majority of Tennesseans do not have the tools and training necessary to survive and prosper in this information age. This deficiency could have drastic implications on Tennessee's future economy. Without these tools, Tennesseans will be separated from the majority of high paying jobs and prevented from participating in and reaping the benefits of a global economy. No single person or group can solve these problems alone; it will take a consolidated effort between the public and private sectors, as well as government agencies of all levels. It is our hope that the findings and data contained in this report will increase awareness and provide the necessary insight to address Tennessee's Digital Divide.



Source: US Census Bureau, December 1998

Table 1

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
Executive Summary	i
Acknowledgements	ix
1. Introduction – Relevance of Computer Ownership and Internet Access.....	1
2. Survey Instrument.....	5
3. Results of Survey.....	6
a. Income Divide.....	10
b. Racial Divide.....	13
c. Geographic Divide – Urban, Rural and Inner Cities.....	16
d. Education Divide.....	19
e. Family Divide.....	22
f. Telephone Penetration.....	23
4. Solutions to the Divide.....	25
Appendix A – Additional Graphics.....	29
Appendix B – <i>Bridging the Gap</i> Summary.....	36

TABLES

<u>Section</u>	<u>Page</u>
Table 1 Computer Ownership and Internet Access in Tennessee.....	v
Table 2 U.S. Computer Ownership By Region.....	6
Table 3 The “DIGITAL DIVIDE” (Map).....	7
Table 4 Tennessee Households Owning a Computer or Laptop, By Year of Acquisition.....	8
Table 5 Tennessee Households Owning a Computer or Laptop.....	9
Table 6 Tennessee and U.S. Households Owning a Computer, By Income.....	10
Table 7 Computer Ownership “The Income Divide”.....	12
Table 8 Tennessee and U.S. Households Owning a Computer or Laptop, By Race.....	13
Table 9 Tennessee Households Owning a Computer or Laptop, By Race, By Year.....	14
Table 10 Computer Ownership “The Racial Divide”.....	15
Table 11 Tennessee Residents Owning a Computer at Home, By Location, By Year.....	16
Table 12 Tennessee Residents with Access to the Internet at Work, By Location.....	17
Table 13 Computer Ownership “The Geographic Divide”.....	18
Table 14 Tennessee Households Owning a Computer or Laptop, By Education.....	19
Table 15 Computer Ownership “The Educational Divide”.....	21
Table 16 Tennessee Households Owning a Computer or Laptop, By Marital Status.....	22

TABLES

<u>Section</u>	<u>Page</u>
Table 17 Percent of Households with Telephone Service (Map).....	24
Table 18 Tennessee and U.S. Households Using the Internet at Home and Outside Home.....	29
Table 19 Tennessee Households Accessing the Internet, By Place of Access.....	30
Table 20 Tennessee Households Owning a Computer or Laptop, By Gender.....	31
Table 21 Tennessee Households Owning a Computer or Laptop, By Income, By Year.....	32
Table 22 Tennessee Households Owning a Computer or Laptop By Location, By Year.....	33
Table 23 Tennessee Households Owning a Computer or Laptop By Education, By Year.....	34
Table 24 U.S. Households Owning a Computer, By Region Rural, Urban and Central City Areas.....	35

Acknowledgments

The TRA acknowledges and thanks the United States Census Bureau and the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce for providing the prototype and the data needed to prepare *Tennessee's Digital Divide*.

Chapter 1

INTRODUCTION

Why is Computer Literacy and Access to Information Technologies So Important?

A quick reading of today's news will underscore the importance of owning a computer and of being connected to the Internet. Scan the employment section of any major U.S. city newspaper and you will likely find columns upon columns of job listings devoted to companies and organizations in search of individuals skilled in the use of computers. Demand for the computer literate is increasing at a rapid pace. In fact, computer and Internet use is at an all-time high among Americans of every class.

A National Telecommunications and Information Administration (NTIA) study, *Falling Through the Net: Defining the Digital Divide*, shows that more Americans are now connected to the nation's information infrastructure than at any time in U.S. history. Since 1994, personal computer ownership and Internet access has escalated among all racial, age, and income groups. The study reveals that 42% of all households now possess a personal computer – a figure up from 37% in 1997, and 24% in 1994. Moreover, the percentage of households connected to the Internet has grown significantly as well, with 26% of households in 1998 reported having Internet access, as compared to 19% in 1997. This growth in connectivity has undoubtedly been made possible by sharply declining computer prices and increasingly affordable Internet access.

But despite the upward trend in personal connectivity, a gap between certain groups of people remains. This gap, referred to as the “digital divide,” is the divide between those with access to the new technologies and those without.

As the information age becomes increasingly a part of American society, what are the consequences of not addressing the chasm between the technology “haves and have-nots?” With Internet and computer accessibility available not only in the home, but from small-town schools and libraries, multi-level office complexes, and neighborhood coffee shops, what are the ramifications for individuals who do not have access to the manifold information technologies many Americans are

presently enjoying? And what is the relevance of computer ownership and Internet access to the society?

The effect of this digital divide is already impacting some sectors of commerce and industry that require, as necessary to employment, some degree of computer literacy. The Information Technology Association of America, for instance, estimates that some 400,000 information technology jobs are unfilled because of a dearth of computer proficient workers; while the NTIA estimates that by the year 2001 at least 60% of all jobs will require computer skills. The Benton Foundation estimates that real wages (adjusted for inflation) for persons with technology skills increased by 10% over the last ten years, while the real wages of workers without technology skills declined by 23%. It is fast becoming reality that computer literacy will be a fundamental skill for all Americans and that being technology literate will be essential for securing and maintaining adequate employment.

Many believe that computer literacy has become the fourth pillar to the traditional three tenets of education: reading, writing, and arithmetic, and that a failure to acquire the now requisite technical knowledge will result in large segments of the U.S. population being left behind because of a lack of computer skills; skills that will prove to be vital to a person's economic success and personal advancement.

Dr. Harry Pachon, President of the Tomas Rivera Policy Institute has opined that, "In the 21st century, computer literacy will be as vital as reading is today."⁴ Adds BellCore researcher and Internet usage analyst James Katz, "The rich are going to be getting richer in terms of information. The information poor will become more impoverished because government bodies, community organizations and corporations are displacing resources from their ordinary channels of communication onto the Internet. To the extent that any demographic group becomes excluded from or underrepresented on the Internet, it will also be excluded from the economic fruits that such participation promises."⁵

Further adding to the discourse is Federal Reserve Chairman Alan Greenspan who proclaims that: "The United States is currently confronting what can best be described as another industrial revolution. The rapid acceleration of computer and telecommunications technologies is a major reason for the appreciable increase in

⁴ Remarks from 1/28/97 news conference. The Tomas Rivera Policy Institute is a non-profit research institute that focuses on issues of concern to the nation's Latino community.

⁵ *Losing Ground Bit by Bit*, the Benton Foundation, 1998.

our productivity in this expansion, and it is likely to continue to be a significant force in expanding standards of living into the twenty-first century.”⁶

Tennessee, along with the rest of the nation, is experiencing unprecedented prosperity in the telecommunications and information technology industries. Consider this sampling of recent headlines from the State’s largest city newspaper outlets:

- **Techies hard to find, are in demand in local job pool.** “When your company’s grown by 625 employees in a little over two years and you expect to hire 150 more, recruiting folks gets to be [an] important part of the business.”– *Memphis Commercial Appeal*, May 2000.
- **Local Internet companies link up.** “Encore Interactive and Passport Health Communications, two local Internet companies [have joined forces]. Passport Health ...acts as a secure electronic clearinghouse for health-care insurers and providers, said it would be using two new customer support applications developed by Encore.”– *The Nashville Tennessean*, April 2000.
- **Internet Pictures Corp. (iPIX)** “The Internet allows users to email, send photos and even view live video from anywhere in the world. [Oak Ridge, Tennessee based] iPIX takes this technology a giant step forward with 360-degree interactive images that put viewers inside the picture. The technology has proven useful for on-line real estate listings.” – *The Knoxville News-Sentinel*, April 2000.
- **NewEraCom Offers Skyrunner Wireless Internet Link.** “An Ashville, N.C. based Internet provider is entering the Chattanooga market with a high-speed wireless service known as Skyrunner. – *The Chattanooga Times & Free Press*, January 2000.
- **Nashville companies racing to stake claims in e-commerce.** “eNashville, a group of Nashville companies, ... is targeting

⁶ Speech to the Charlotte (N.C.) Chamber of Commerce, July 10, 1998.

buyers of country music with an Internet site that allows visitors to see videos and listen to music.” – *The Nashville Tennessean*, October 1999.

- **Dell Computer confirms Midstate deal.** “Tennessee officials welcomed Dell Computer Corp. ... as the PC giant confirmed plans to add at least 3,000 manufacturing and office jobs to the Nashville economy by 2004.” – *The Nashville Tennessean*, May 1999.

The information age is thriving in Tennessee. Nevertheless, far too many in our State are not a part of this technology revolution. This report takes a look at the accessibility of technology in Tennessee and identifies areas of concern, and discusses possible approaches and solutions for addressing the many issues associated with the digital divide.

In an ever expanding and rapidly evolving electronic economy, certain technical competencies will be necessary not only for vocational advancement, but for personal productivity and fulfillment. Thus, it is our belief that the relevance of computer ownership and Internet access for the citizens of our State, given the almost certain consequences, cannot be overlooked.

Chapter 2

Survey Instrument

This report profiles trends in computer ownership and Internet usage in Tennessee. Comparable studies have been prepared on a national level by the U.S. Department of Commerce in 1995, 1998 and 1999 for its *Falling Through the Net; Defining the Digital Divide Reports*.

Tennessee's Digital Divide uses the same survey instrument utilized by the Department of Commerce. Data for both studies was obtained from the United States Census Bureau's "Current Population Survey" (CPS) completed in December 1998. This survey included numerous questions on telephone subscribership, computer ownership and Internet access.

The data for *Tennessee's Digital Divide* was derived from responses of Tennessee households to the "Current Population Survey." The CPS involves a door-to-door survey of 48,000 households across the nation. The Census Bureau cross-tabulated the responses according to specific variables such as income, race, education level and household type along with geographic determinations such as urban, rural and central cities. The survey sample for this report includes 900 Tennessee households.

It is important to note that the data for this report is taken from a larger national sample and like all statistics is subject to sampling errors. All efforts have been made to minimize such errors.

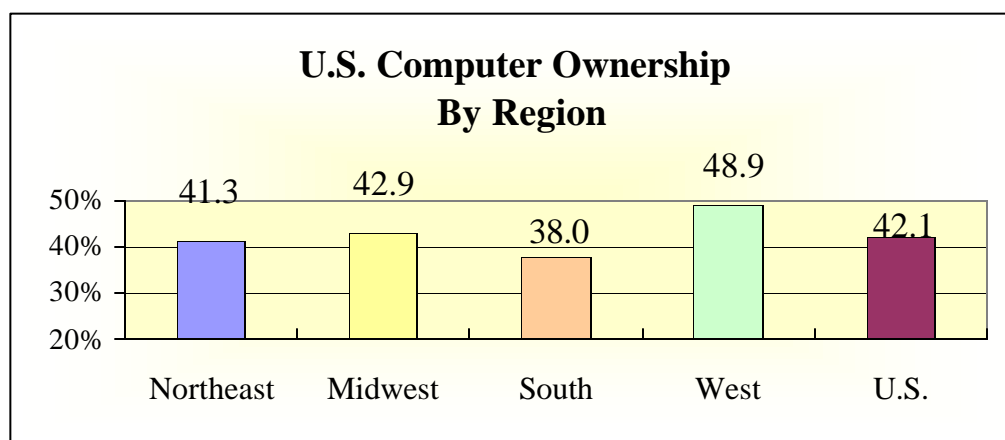
Chapter 3

The Results

The results of the survey include both good news and bad news. The good news is that more Tennesseans purchased computers and accessed the Internet in 1998 than ever before. Fourteen percent of Tennessee households purchased a computer in 1998. Since 1994, computer ownership in Tennessee has doubled.

The bad news is that only 37.5% of Tennesseans owned a computer as of December 1998 and that computer penetration in Tennessee is growing at a slower pace than the nation as a whole. Tennessee's computer penetration is 11% below the national average, which ranks the State 40th in the nation. In addition, only 21.3% of Tennesseans had access to the Internet at December 1998, which ranked Tennessee 42nd in the United States. Table 2 provides a map showing the computer penetration rate in each of the fifty states.

While Tennessee's low rate of computer ownership is cause for concern, of greater concern is the growing gap in computer ownership between low-income and high-income households, between African-American households and Caucasian households, between rural or inner city households and suburban households, and between the less-educated and more highly educated. The following pages demonstrate that Tennessee's higher income, more highly educated, urban households are generally the "haves" when it comes to the tools needed in today's information age, while the lower income, less educated rural households are typically the information "have nots."⁷



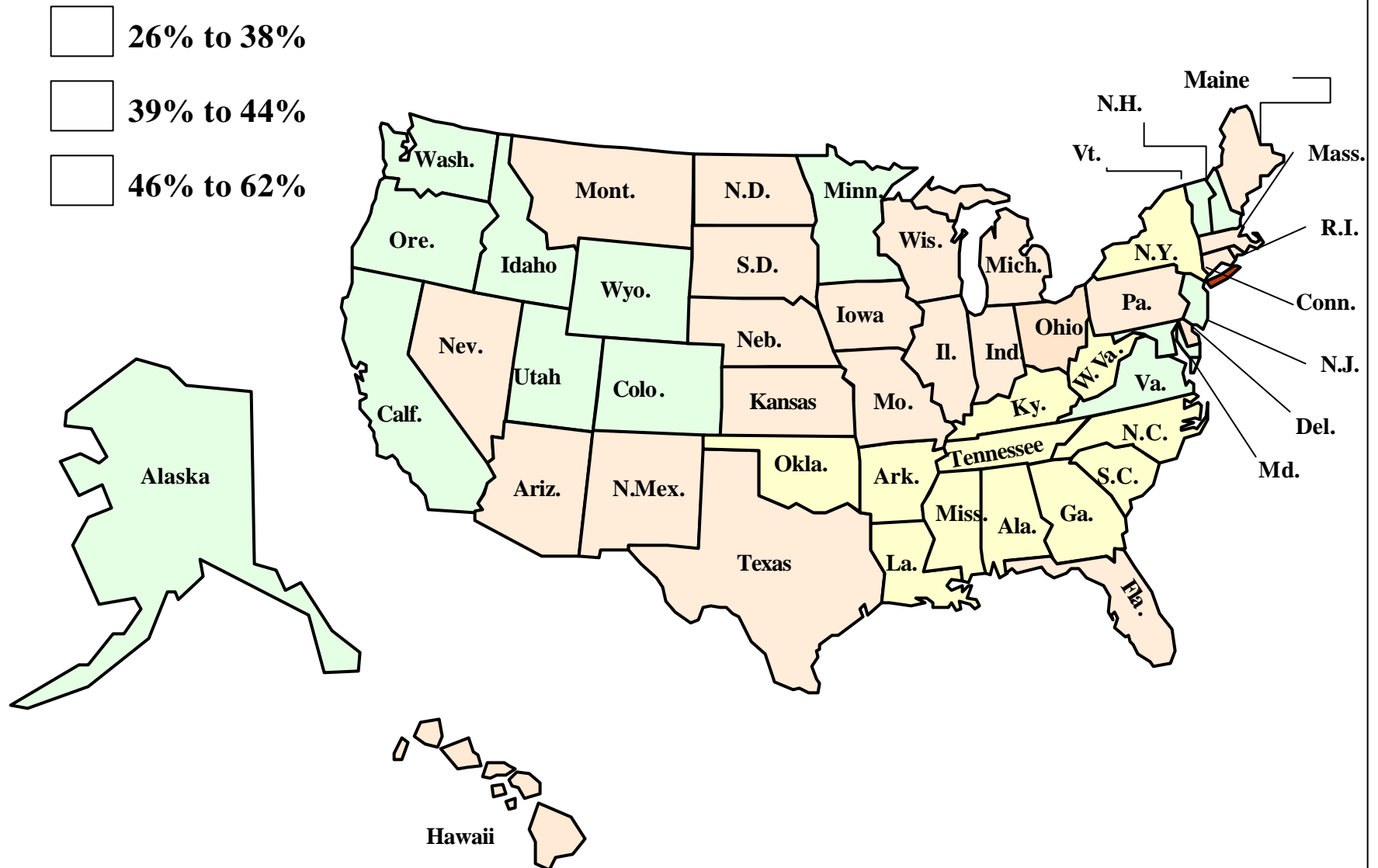
Source: US Census Bureau.

Table 2

⁷ The demographic categories in this study were examined independently and no attempt was made to determine the interrelationships among the categories.

The “DIGITAL DIVIDE”

In 1998, 37.5% of Tennessee’s households had computers



Sources: Department of Commerce & The Tennessean

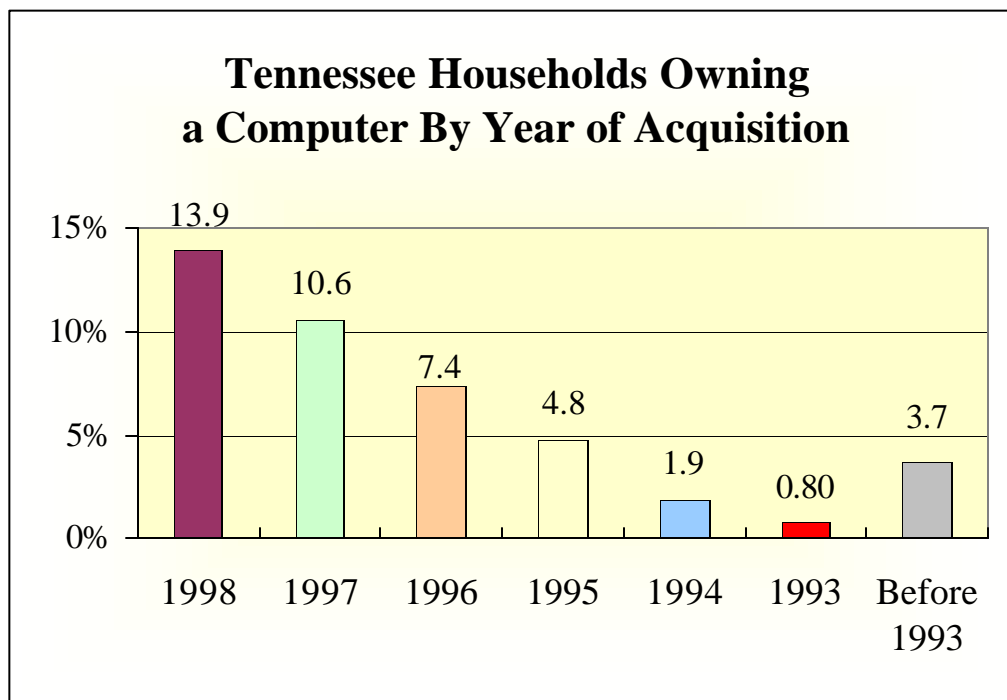
Table 3

Additionally, the survey shows that computer penetration among Caucasian households is significantly greater than Tennessee's African-American or Hispanic households.

Finally, the national survey shows that Southern states lag behind other regions of the nation in computer ownership and access to the Internet (Table 3). According to NTIA statistics, nine of the bottom ten states in computer ownership are Southern states. In its *Falling Through the Net* report, the NTIA found:

“The West has remained significantly ahead of other regions in computer ownership...the Midwest was the second highest connected region...Meanwhile, the South (particularly the rural areas) has lagged far behind other areas in PC penetration rates.”⁸

While Tennessee ranks ahead of a number of Southern states in computer ownership and Internet access, this report will clearly demonstrate that our State is facing a technology divide that could have dire economic and social implications if not addressed quickly and adequately.

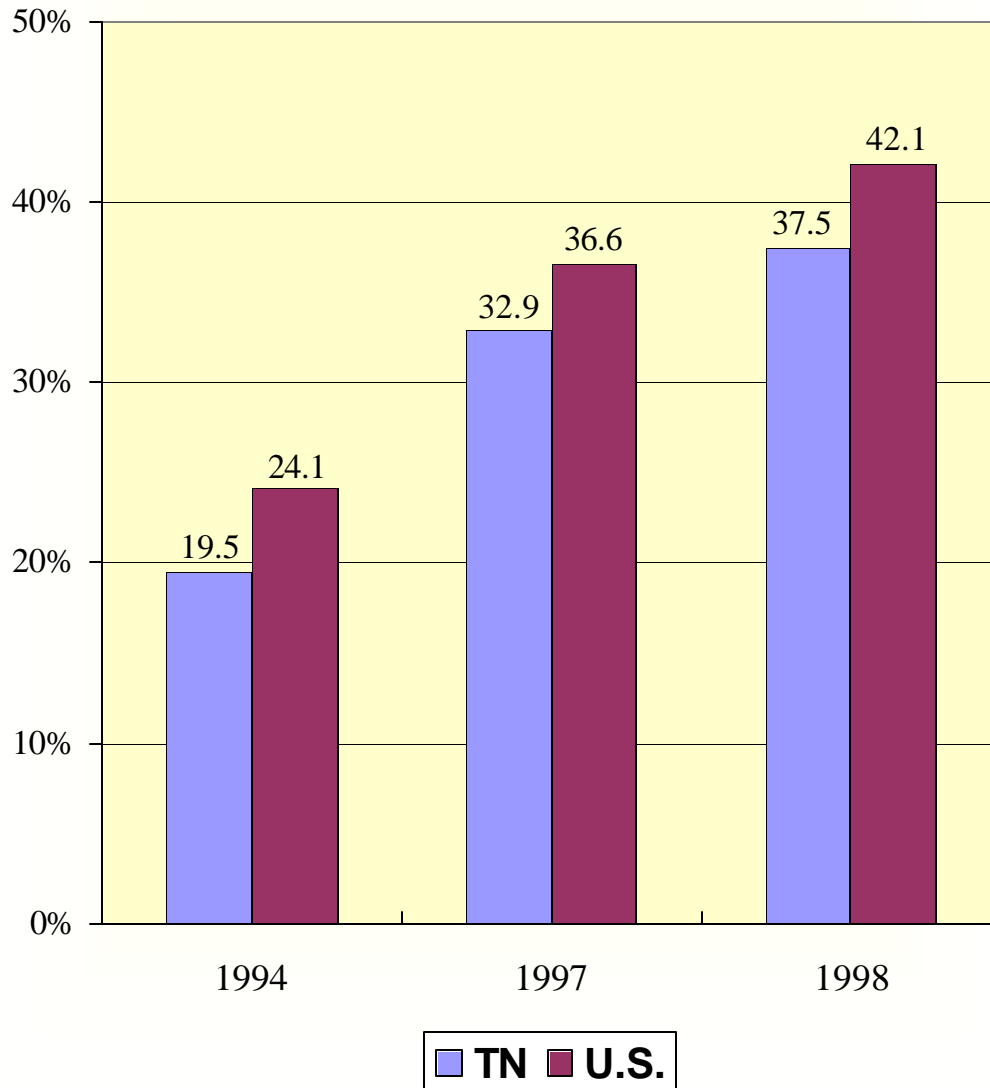


Source: US Census Bureau

Table 4

⁸ *Falling Through the Net: Defining the Digital Divide*. U.S. Department of Commerce, National Telecommunications and Information Administration, July 1999.

Tennessee Households Owning a Computer or Laptop



Source: US Census Bureau, December 1998

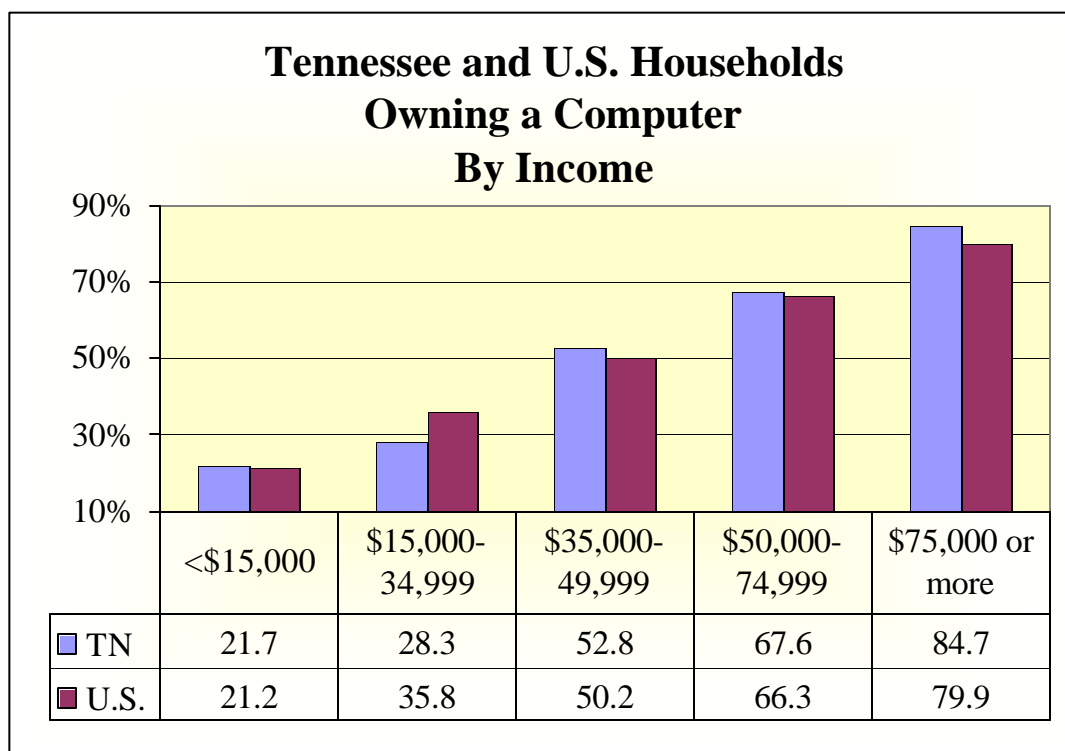
Table 5

Chapter 3a.

The “Income Divide”

The divide among different income levels is the most glaring discrepancy identified by the survey. The survey clearly demonstrates that the lower a person’s income, the less likely that person owns a computer or has Internet access. As shown on Table 6, Tennessee households earning more than \$75,000 annually are **four** times more likely to own a computer than a Tennessee household earning \$15,000 or less and **three** times more likely to own a computer than a household earning between \$15,000 and \$35,000 annually.

While computer ownership among all income levels has increased since 1994, computer ownership among higher income levels is growing at a much faster rate than the lower income levels, thus increasing this “income divide.” The gap in computer ownership between Tennessee households with annual incomes greater than \$75,000 and households with annual incomes \$15,000 or less **increased** by 13% between 1997 and 1998. While it is somewhat understandable, but not necessarily acceptable, that lower income households are less likely to own a computer, the fact that the gap between income levels is expanding is a cause for great concern.



Source: US Census Bureau, December 1998

Table 6

TENNESSEE’S DIGITAL DIVIDE

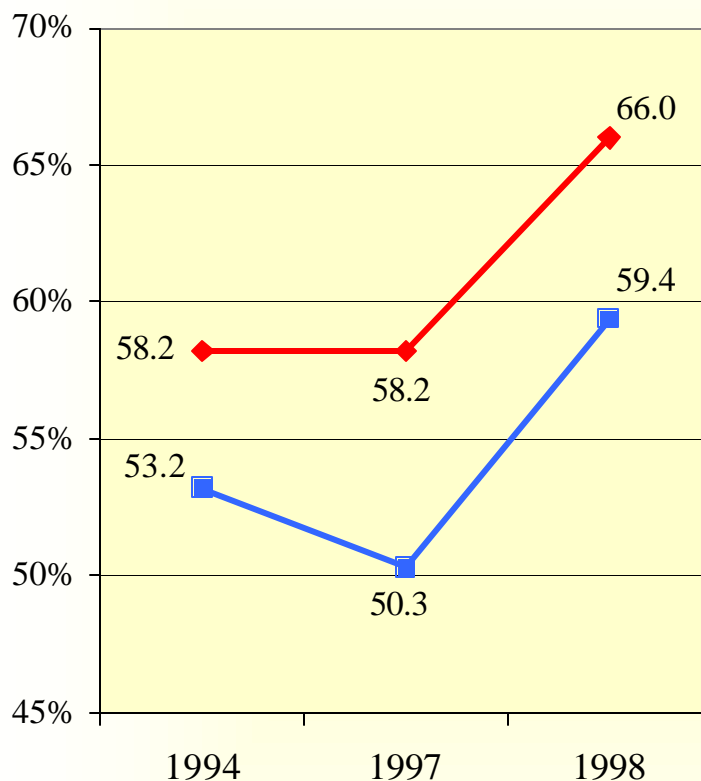
Although many observers contend that declining computer prices will reduce this divide, the survey results appear to prove otherwise, at least at this time. Although Tennessee's "income divide" is characteristic of the nation as a whole, the divide in Tennessee appears to be increasing more rapidly than the rest of the nation. Nationally, the gap in computer ownership between households with annual incomes greater than \$75,000 and households earning less than \$15,000 increased by 1.6 % between 1997 and 1998.

The survey also shows that lower income persons are less likely to have access to the Internet at their place of employment. The NTIA, however, reports that many Americans without computers or Internet access at home or work are making use of public resources such as libraries and community centers to access the Internet.

"TENNESSEE'S DIGITAL DIVIDE"

Computer Ownership

"The Income Divide"



The *gap* in computer ownership between households earning in excess of \$75,000 annually and households earning less than \$15,000 annually **increased 13%** from 1997 to 1998.

- ◆ Percentage gap between households earning \$75,000 or more annually and households earning \$15,000 or less annually.
- Percentage gap between households earning \$75,000 or more annually and households earning between \$15,000 or \$35,000 annually.

Source: US Census Bureau

Table 7

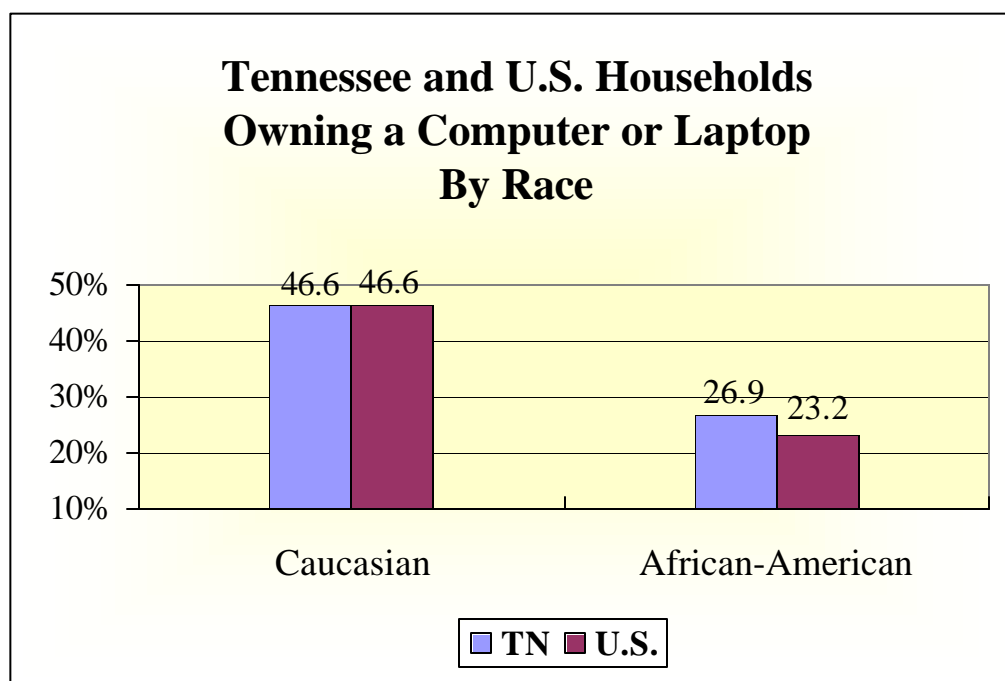
Chapter 3b.

The “Racial Divide”

Access to information resources also appears to be creating racial boundaries. Caucasian households in Tennessee are twice as likely to own a computer than Tennessee’s African-American households. Although half of Tennessee’s Caucasian households own personal computers, only one of four African-Americans households own a computer (Table 8).

While the above outcomes are disturbing, the fact that this racial divide is widening is even more alarming. The gap in computer ownership between African-American households and Caucasian households is now 20% greater than it was in 1997. Between 1997 and 1998, computer penetration among Caucasian households increased **12%** while computer penetration among African-Americans grew by only **7%** (Table 9).

The sample of Tennessee households did not contain enough observations from the Hispanic population to draw valid conclusions. However, the



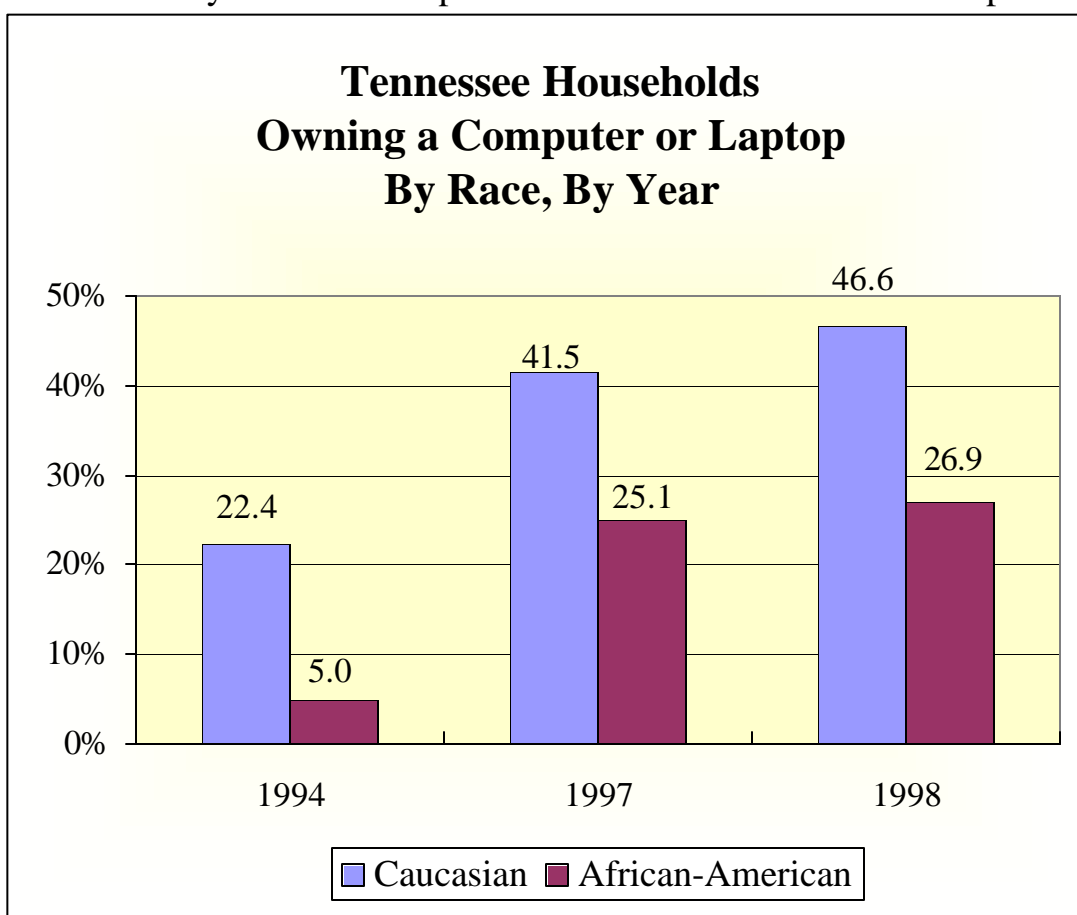
Source: US Census Bureau, December 1998

Note: The survey instrument did not contain enough responses from the Hispanic population to draw any valid conclusions.

Table 8

NTIA's national survey shows that only one of every four Hispanic households own computers.

The NTIA's 1999 study also found that for the first time there is no discernible difference in computer penetration between Caucasian and African-American households earning more than \$75,000 annually. This suggests that the most affluent families, irrespective of race, are utilizing information resources. For every other income category, however, computer ownership among Caucasian households was always higher than for African-Americans or Hispanics. For example, for those households with annual incomes less than \$15,000, Caucasians were twice as likely to own a computer than African-Americans or Hispanics.



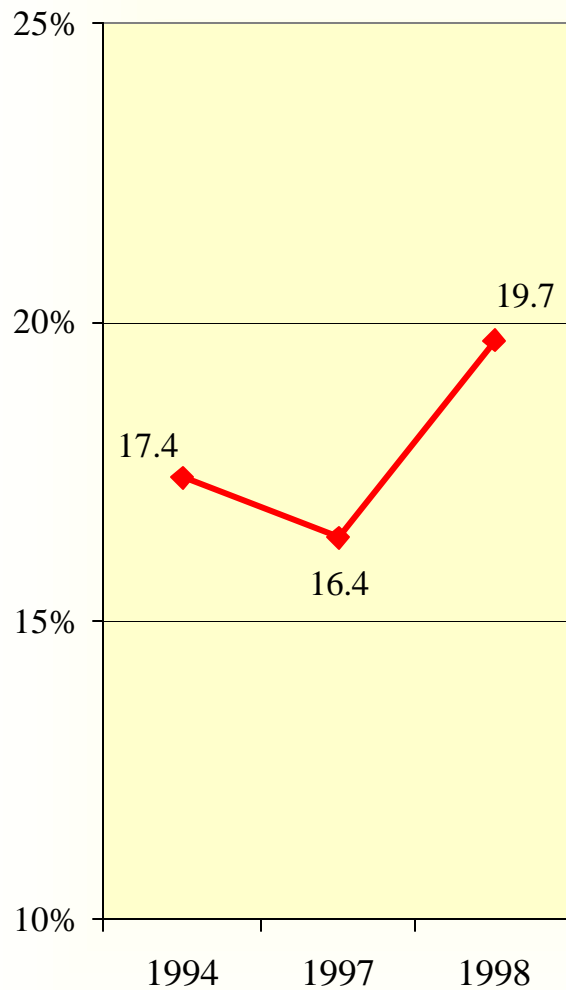
Source: US Census Bureau, December 1998

Table 9

TENNESSEE'S "DIGITAL DIVIDE"

Computer Ownership

"The Racial Divide"



The *gap* in computer ownership between African-American households and Caucasian households *increased* **13%** from 1994 to 1998 and **20%** from 1997 to 1998.

—◆— Percentage gap between African-American and Caucasian households.

Source: US Census Bureau

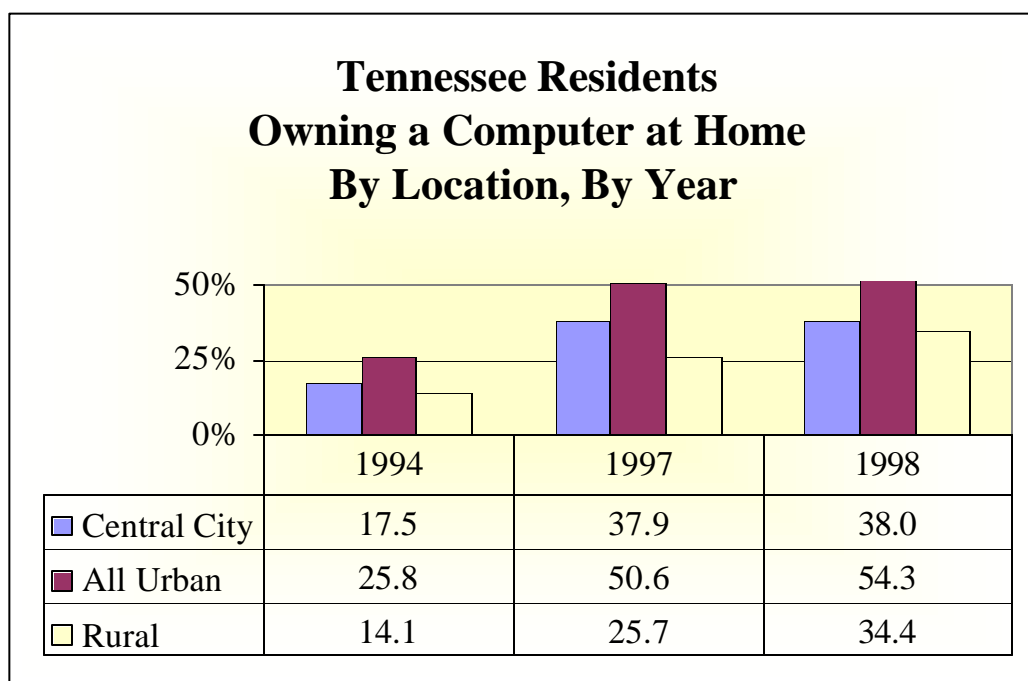
Table 10

Chapter 3c.

The “Geographic Divide”

As indicated previously, Southern states lag behind other regions of the nation in computer ownership and access to the Internet. Computer penetration in rural Southern households is particularly low; 16% lower than the national average. Only inner cities in the Northeast have a lower penetration than the rural South. Similar to other Southern states, computer ownership in Tennessee’s rural areas lags far behind computer ownership in the urban areas of the State. While over half of Tennessee’s urban residents own a computer, only one-third of rural residents own computers. Table 11 shows computer ownership percentages for the State’s rural, urban and inner cities.

This “geographic divide” exists among all income levels. The NTIA survey shows that in virtually every income range, urban households are more likely to own a computer and have Internet access than rural residents with comparable incomes. Not only are rural Tennesseans less likely than urban Tennesseans to own a computer, they are also only half as likely to have Internet access at work or at a community center such as a library.



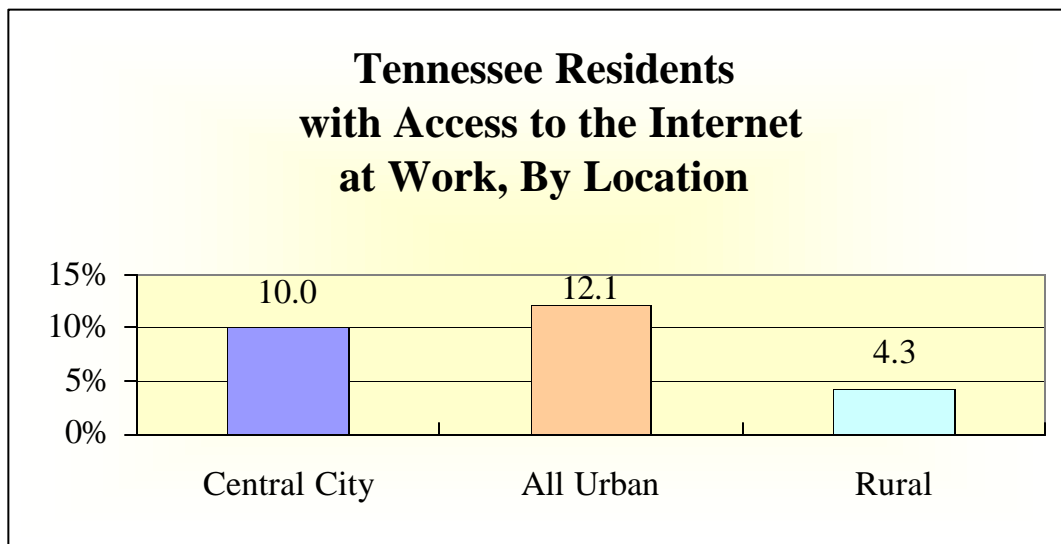
Source: US Census Bureau, December 1998

Table 11

Unlike the other “divides,” Tennessee’s geographic divide between urban and rural consumers appears to be dwindling. From 1997 to 1998, the gap in computer ownership between Tennessee’s urban and rural households **decreased** by 20% (Table 12). The bad news, however, is that the gap between inner city households and other urban households **increased 28%** between 1997 and 1998. This appears to be mainly the result of income discrepancies between the inner cities and other urban areas.

Although only one in three rural Tennesseans own a computer, the declining urban/rural divide is cause for optimism. The most likely reason for this decline is increased availability of information services in rural areas of the State. A recent survey by the TRA shows that Internet access via telephone lines or cable modems is now available in every Tennessee county.

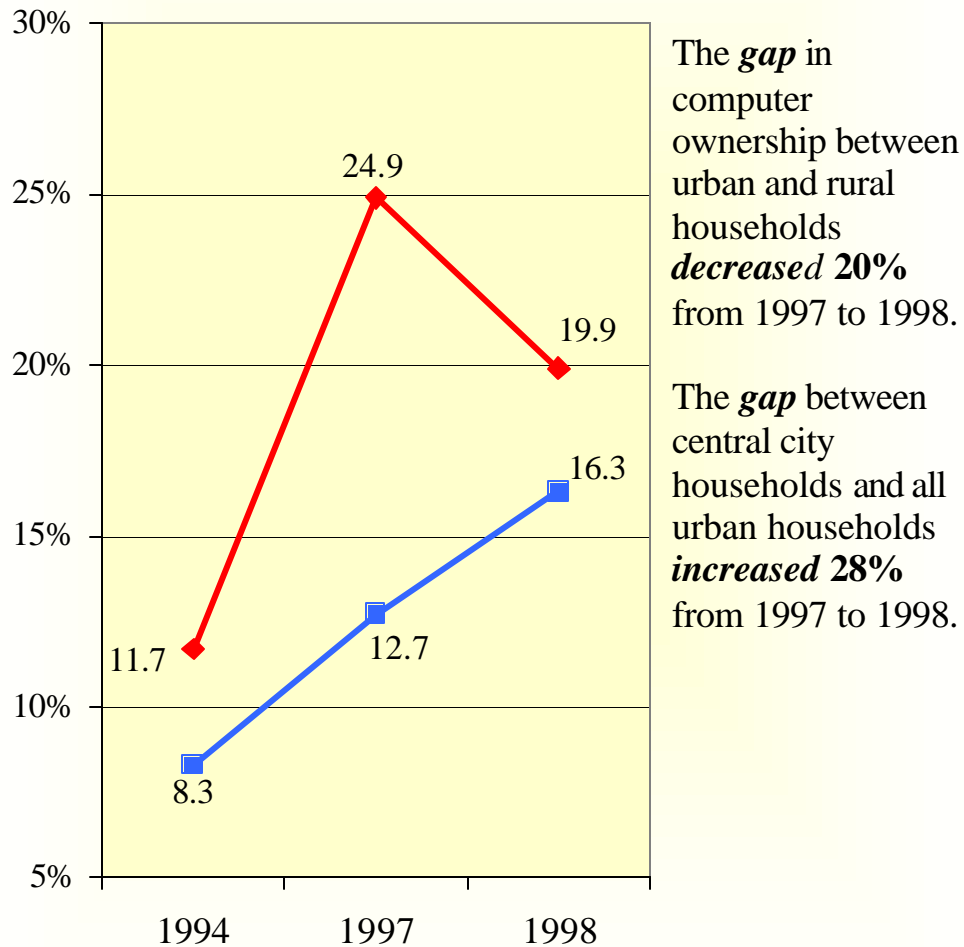
While rural areas of Tennessee currently have access to basic information and data services, regulators are concerned that the telecommunications infrastructure in many rural areas is not capable of providing the latest high-speed digital broadband technology like the digital subscribe lines used to provide high speed Internet access. Cable providers, telecommunications companies, regulation and technological advancements will all play vital roles in making advanced services available throughout the State.



Source: US Census Bureau, December 1998

Table 12

TENNESSEE'S "DIGITAL DIVIDE" **Computer Ownership** **"The Geographic Divide"**



The *gap* in computer ownership between urban and rural households ***decreased 20%*** from 1997 to 1998.

The *gap* between central city households and all urban households ***increased 28%*** from 1997 to 1998.

- ◆ Percentage gap between rural and urban households.
- Percentage gap between central city households and all urban households.

Table 13

Chapter 3d.

The “Education Divide”

Computer ownership also appears to be closely tied to one’s level of education. Not surprisingly, households with higher education levels are far more likely to own a computer and have access to the Internet than lower education households. In addition, higher education households continue to purchase computers at a faster rate than less educated households, creating an ever increasing “education divide.”

The survey found that persons with a college degree are **2.5** times more likely to own a computer than someone with a high school education and **3.5** times more likely than some without a high school diploma.

As shown on Table 15, Tennessee’s “education divide” continues to widen. In 1994, the gap in computer ownership between high school graduates and college graduates was 35.8 percentage points. In 1997, the gap increased to 38.7 percentage points and in 1998 the gap rose to 43.8 percentage points; an overall increase of 22% since 1994. Nationwide, the education gap has remained constant since 1997.

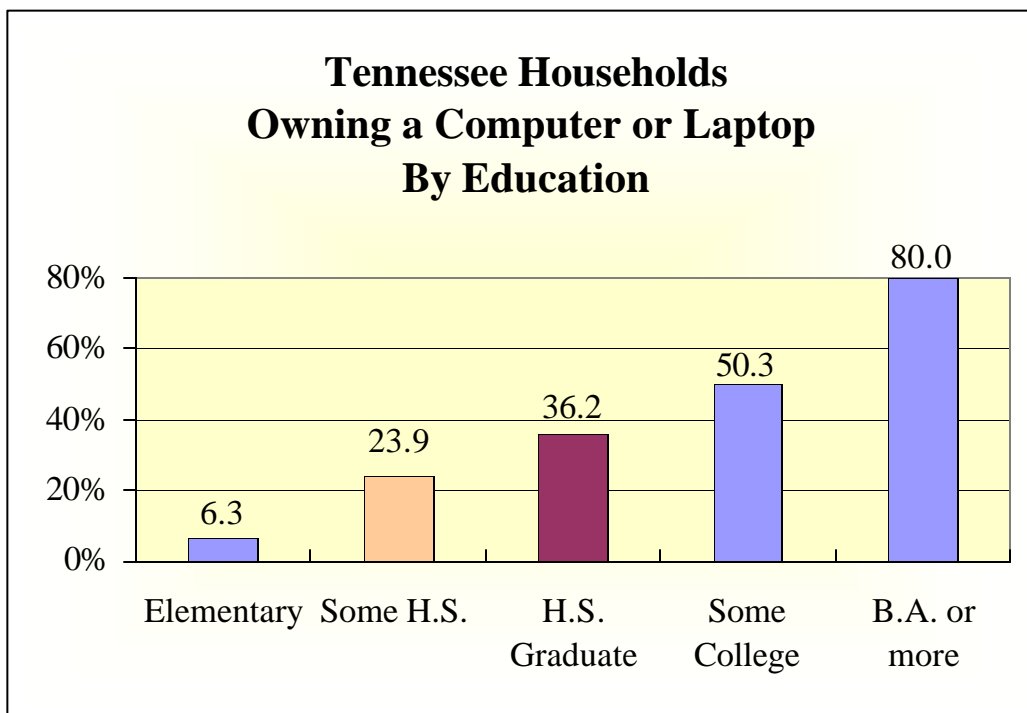


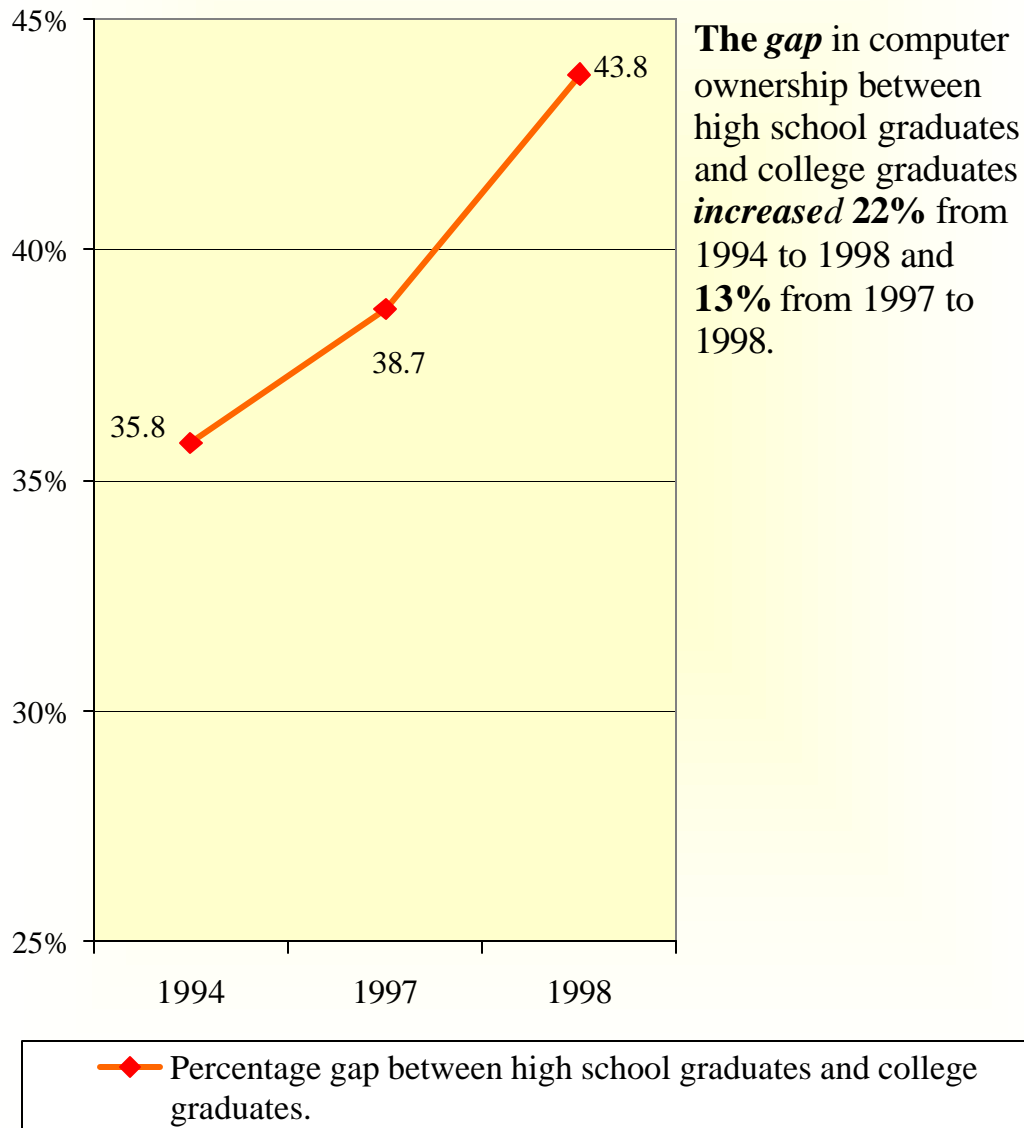
Table 14

Tennessee has done an outstanding job making computers and Internet access available to schools throughout the State. Tennessee continues to rank in the forefront among states in this area. Many educators, however, say that this is not enough. The actual amount of time during school that students spend on the computer is, in most instances, minimal and not sufficient to develop the skills needed in this era of information technology. A number of communities around the nation have instituted programs to provide computers and Internet access in the homes of low-income families. As discussed in more detail in Chapter 4, access to a computer in the household has had a positive impact on the academic performance of the students, as well as noteworthy benefits to the parents of the recipients.

TENNESSEE'S "DIGITAL DIVIDE"

Computer Ownership

"The Educational Divide"



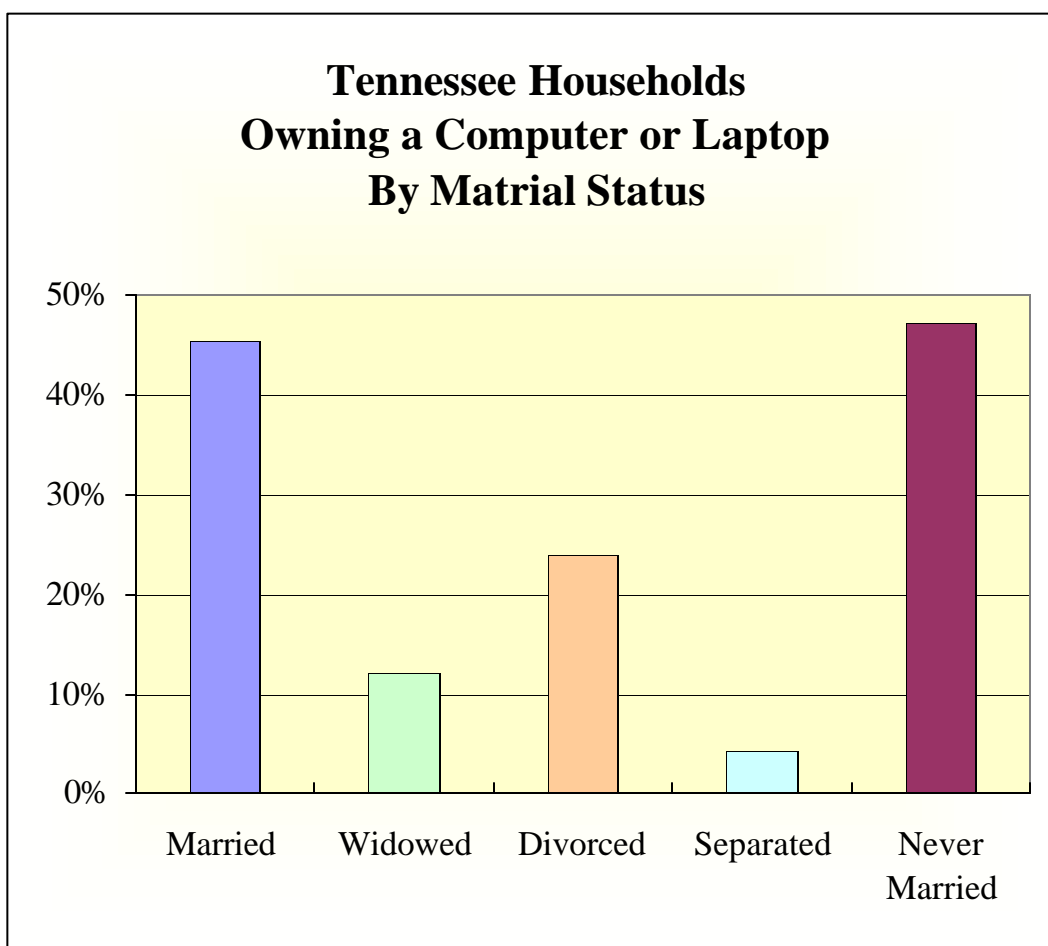
Source: US Census Bureau

Table 15

Chapter 3e

“The Family Divide”

The survey also examined computer ownership according to the make-up of the household. In Tennessee, like the entire nation, single parent households lag far behind the rest of the nation in computer ownership. As shown on Table 16, two parent households in Tennessee are **twice** as likely to own a computer than single parent households. Nationally, two parent households with children have the highest home computer ownership rate, 61.8%, while female-headed households with children have a computer ownership rate of use rate of only 31.7%.



Source: US Census Bureau, December 1998

Table 16

Chapter 3f.

Telephone Availability in Tennessee

Of course, a telephone line is required, in addition to a computer, to access the Information Superhighway. While this report generally focuses on computer ownership and Internet access, this section provides a brief discussion of telephone subscribership in Tennessee.

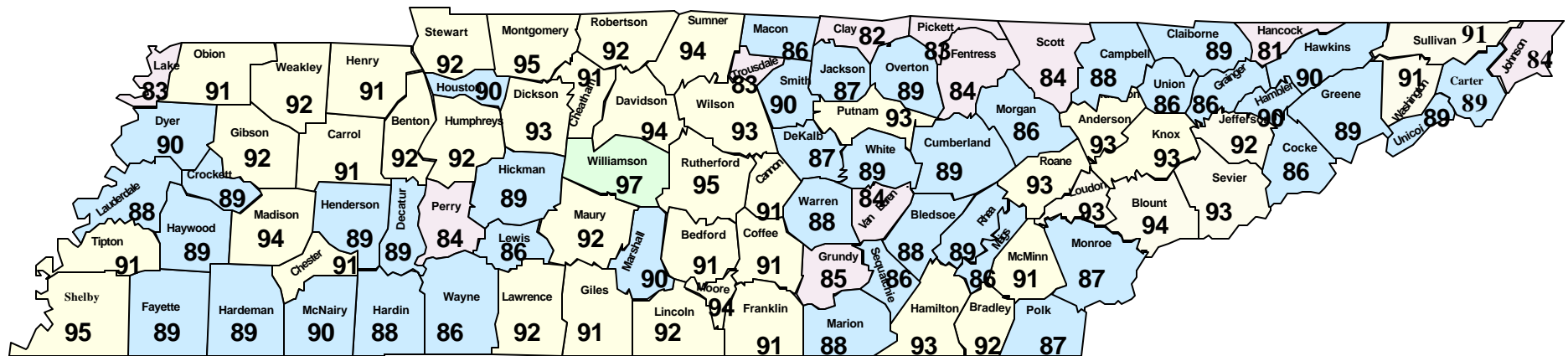
Since 1990, Tennessee's percentage of households with telephone service is statistically indistinguishable from the national average of 94.1%. When examined more closely, however, considerable variation exists between the urban areas of the State and the rural areas. As shown on Table 17, some urban counties approach 100% telephone subscribership while a few rural counties barely achieve 80% penetration. Overall, Tennessee performs as well as the nation as a whole, but room remains to improve universal telephone access. The Tennessee Regulatory Authority is committed to achieving affordable telephone availability throughout the State and has taken numerous steps to achieve this goal. For example:

1. Tennessee actively participates in the Federal Lifeline and Link-up programs, which provide assistance to low-income consumers.
2. The TRA is in the process of developing a universal service fund to provide a subsidy for companies providing residential telecommunications in the high cost areas of the State. Typically, it is more costly to provide telecommunications in the less-populated rural areas of the State as opposed to the more densely populated urban areas.
3. The TRA previously adopted intrastate discounts for telephone lines to the State's schools and libraries.

Additionally, there are numerous federal programs to provide universal telephone access throughout the nation.

Telephone Subscribership in Tennessee (1990)

Percent of Households with Telephone Service



Chapter 4

Solutions to Tennessee's Digital Divide

As we addressed in Chapter 1, technology literacy is rapidly becoming as important and essential as reading, writing and arithmetic. What steps can be taken to make sure that all Tennesseans are prepared to survive and prosper in this technology revolution?

At least three distinct initiatives aimed at bridging the digital divide have emerged. First, governments must establish and implement pro-competitive policies. The pro-competitive policies initiative is grounded upon the basic idea that more Americans will productively use the Internet and other technology services if essential telecommunications infrastructure is made widely available to everyone at affordable rates. It is essential to the nations' economic well being that all Americans be provided with the tools needed to survive in the emerging digital economy. Policymakers and regulators must therefore develop and support policies that will encourage the widespread deployment of advanced technologies in both the computer and telecommunications industries. To implement this objective, governments must build innovative relationships with public utilities and other private companies conducive to promoting pervasive voice, data, and video communications services that can benefit citizens and businesses as well as increase public involvement in government.

In addition to advocating the growth of wide-scale deployment of advanced technologies, governments must also take steps to ensure that such technologies will remain affordable for all citizens. The most advanced network in the world is of little use if personal financial or social constraints keep many Americans from accessing these services. With this in mind, many governmental bodies have established or are seeking to establish pro-competitive Universal Service policies. One general approach has been the creation of Universal Service funding mechanisms. For instance, Universal Service funds are established to subsidize the cost of telecommunications services in high-cost and under-served regions. Such a fund will not only help assure affordable access to existing telecommunications services, but should also encourage competing companies to enter under-served markets, thereby supporting the deployment of new and advanced technological services to more areas.

Second, public access points are fundamental for helping connect some of the most technologically under-served populations. The NTIA reports that households with

annual incomes of less than \$20,000 and African-American households are twice as likely to gain Internet access through a public library or community center than are households earning more than \$20,000 annually or Caucasian households. The industry research and literature also reveal that people who use libraries and other public access points are more likely than other groups to use the Internet to find jobs or to advance their education. Thus, public access to computers and the Internet will play a role similar to that which public payphones did in providing telephone access to those who for various reasons did not have a telephone in their home.

Given the clear benefits of public access points at this juncture, governments and industry should strive to establish programs that provide Internet access at more locations convenient to under-served populations. For instance, Microsoft and the Bill and Melinda Gates Foundation have been substantial benefactors in making information technologies available in public access points by partnering with state and local governments to provide computers and software to public libraries serving low-income communities. Microsoft has committed to providing grants totaling more than \$200 million to 11,000 libraries in the United States and Canada. Microsoft has also teamed with the Boys and Girls Clubs of America to improve access to technology by creating technology centers throughout the nation. Partnerships like these are essential to bridging the digital divide.

While public libraries make excellent public access points, programs should be developed to explore other possibilities. For instance, most secondary schools, community colleges, and universities operate large computer laboratories in publicly accessible buildings located within the community. Many of these laboratories are already connected to the Internet and, with proper management and control; perhaps some of these locations could be expanded into operational public access points. Other areas, such as common areas in shopping districts and malls, should be considered for public access programs as well.

Lastly, public and private sector partnerships have emerged to provide necessary training and equipment to under-served populations. It is extremely important to draw on the resources of the private sector, and many private companies have expressed a willingness to become involved in this important initiative. The major corporations that have entered into partnerships to further technology accessibility include: 3Com, Ameritech, Apple Computer, AT&T, AOL, BellSouth, Cisco, IBM, Intel, MCI/WorldCom, Microsoft, and SBC. Although many of these corporations have established partnerships with schools and school districts to provide advanced technologies in our classrooms, access during school hours is

limited to a short duration, making access outside the classroom fundamental for developing needed skills and abilities. Thus, technical training programs for the young and old alike are also necessary to bridge the digital divide. According to Larry Irving, former Assistant Secretary of the NTIA, an investment in training programs is “an investment in the economic, professional and personal growth of hundreds of thousands, if not millions of Americans.”⁹

A number of accomplished partnerships are realizing some measure of success in closing the digital divide. One such partnership is *PowerUp*, which is comprised of more than a dozen nonprofit organizations, major corporations, and federal agencies. The *PowerUp* team has joined together to launch a major new multimillion-dollar initiative to help ensure that America’s under-served young people acquire the skills, experience, and resources they need to succeed in the digital age. *PowerUp* has elicited the assistance of Gateway and the Waitt Family Foundation in carrying out their mission. Working with the Waitt Family Foundation, Gateway will supply computer hardware to *PowerUp* by providing up to 50,000 Gateway computers and Internet appliances over the next three years. Other successful initiatives include the National Urban League, which has developed a program that provides to low-income families refurbished Pentium computers, Internet access, and training for the relatively low fee of \$250. The National Urban League is also working with Ameritech to establish digital campuses in the Midwest.

Local communities have also conducted trials to get computers into the homes of their low-income families. One of the most successful trials is occurring in Minnesota where two school districts have joined together to provide laptop computers, family-based training, and technical support to a hundred low-income fourth graders. Parents and teachers report that the grades and schoolwork of these students have improved, that the children read more, and that their self-esteem is higher. Another advantage of the program is that it offers the students a way to learn about the outside world. Coordinators of the program also found that the parents have benefited greatly. Through the family-based training, parents learned computer skills that improved their job skills and enhanced their opportunities. Additionally, school officials report that parents participating in the program have become more involved with their children’s school activities. (Additional information on this project is found in Appendix B.) In addition to Minnesota, similar trials are being conducted in Mississippi and North Carolina. Such

⁹ Remarks by Larry Irving at the National Press Club, July 8, 1999.

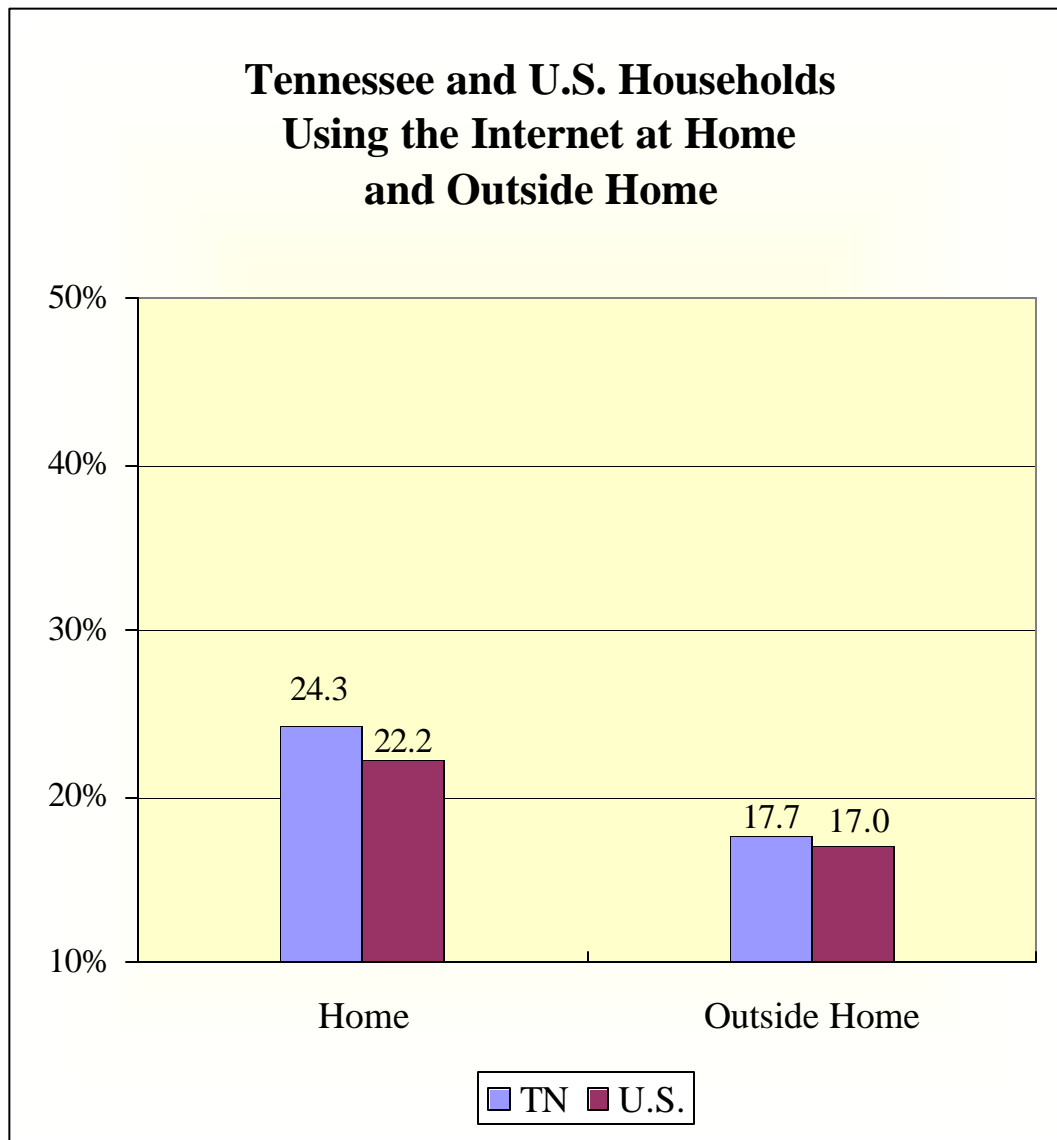
programs provide many positive results and could serve as the prototype for local projects in Tennessee.

Of all these initiatives, typically the most effective solutions are those involving the cooperative efforts of government, industry, and the community. Such programs obviously involve a high degree of communication and coordination among the different groups and organizations involved. Along these lines, an appropriate governmental role would be the designation and appointment of resource personnel to organize partnership programs by communicating and coordinating the various activities of interested parties.

In conclusion, *Tennessee's Digital Divide* clearly demonstrates that a majority of Tennesseans do not have the tools and training necessary to survive and prosper in this information age. This deficiency could have drastic implications on Tennessee's economy. Without these tools, Tennesseans will be cut off from the majority of high paying jobs and prevented from participating in and reaping the benefits of a global economy. No single person or group can solve these problems alone; it will take a consolidated effort between the public and private sectors as well as government agencies of all levels. It is our hope that the findings and data contained in this report will increase awareness and provide the necessary insight to address Tennessee's Digital Divide.

VII. Appendix A

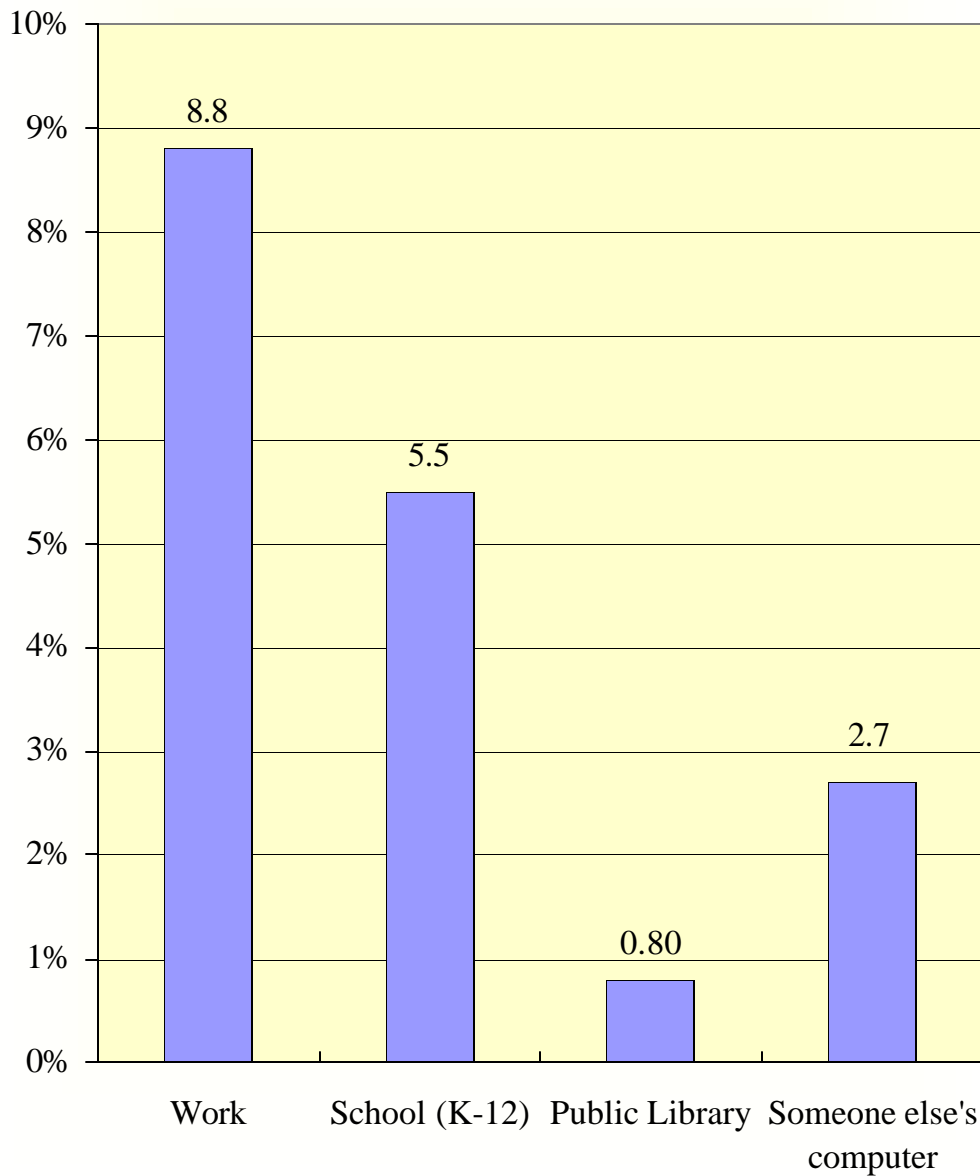
The following pages contain additional graphs that were not included in the report but may be helpful in further analyzing Tennessee's Digital Divide.



Source: US Census Bureau, December 1998

Table 18

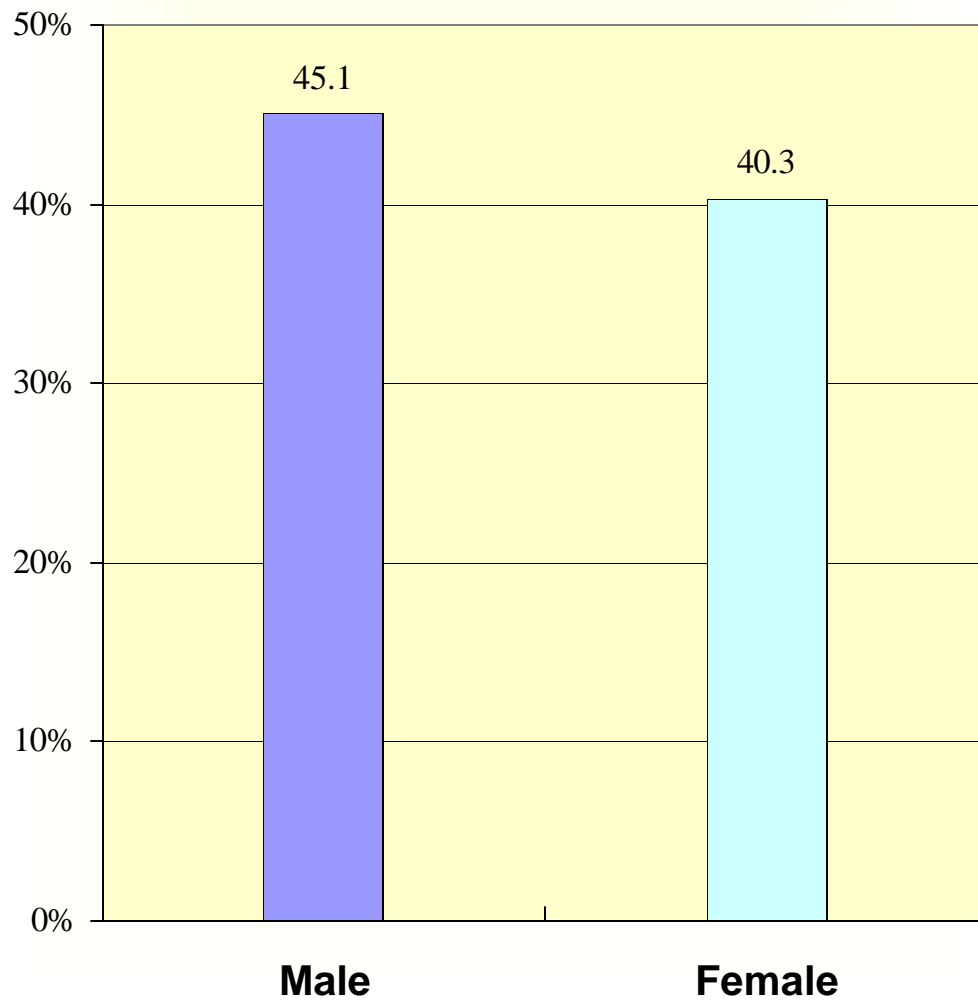
Tennessee Households Accessing the Internet By Place of Access



Source: US Census Bureau, December 1998

Table 19

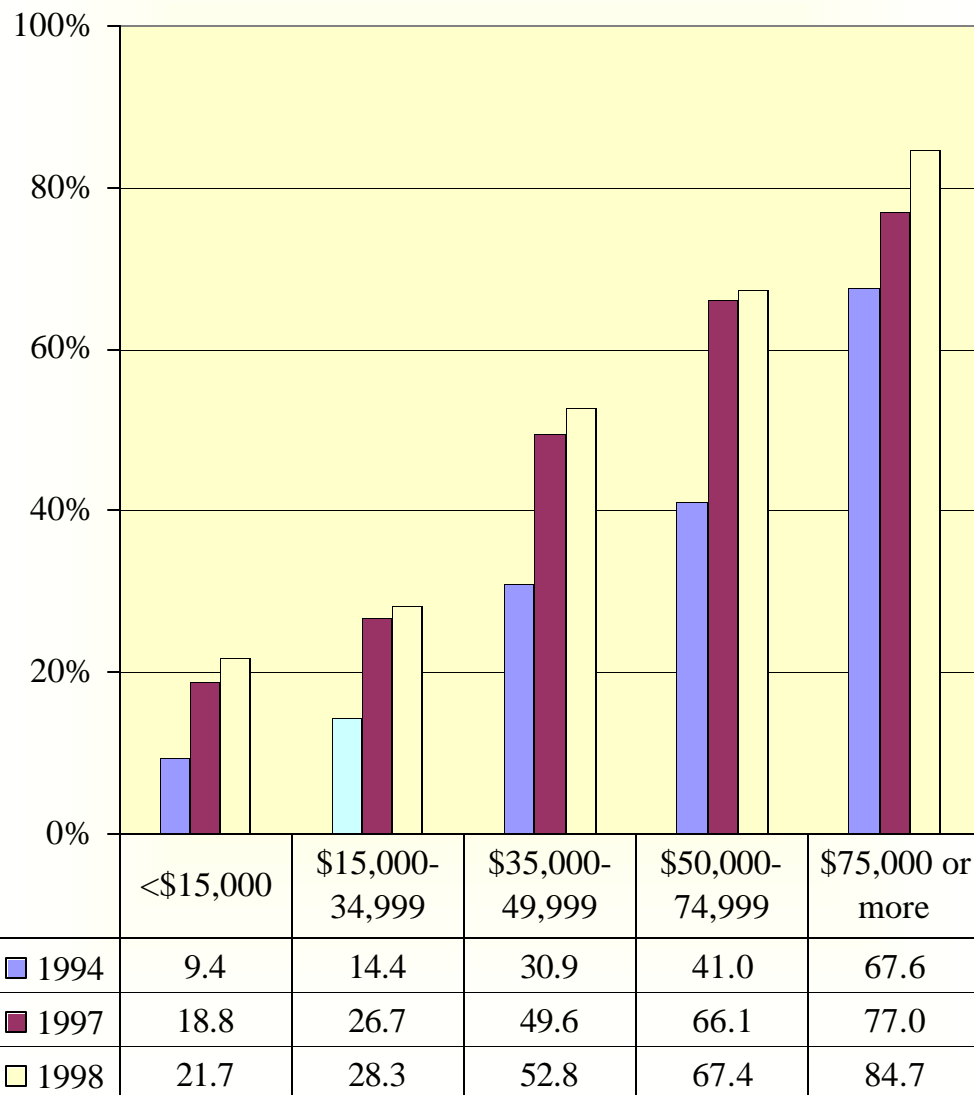
**Tennessee Households
Owning a Computer or Laptop
By Gender**



Source: US Census Bureau, December 1998

Table 20

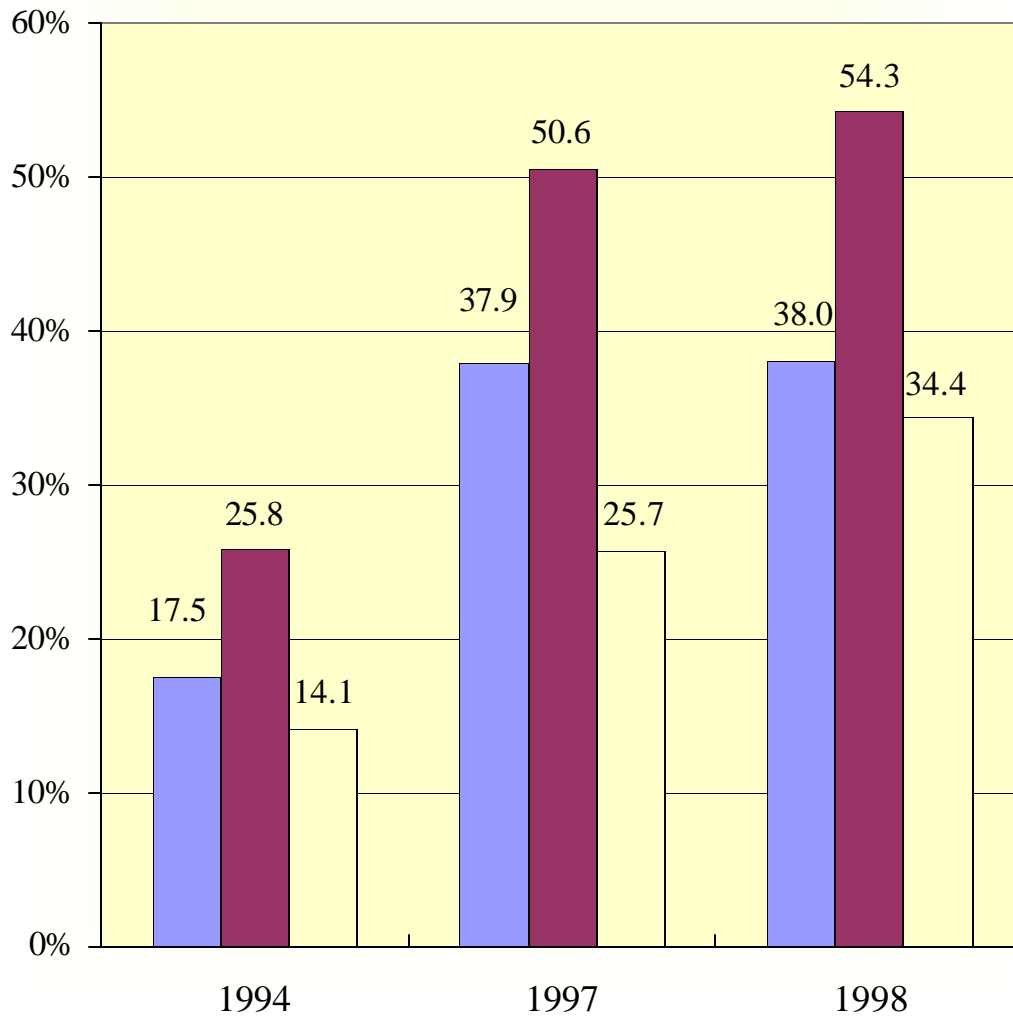
Tennessee Households Owning a Computer or Laptop By Income, By Year



Source: US Census Bureau

Table 21

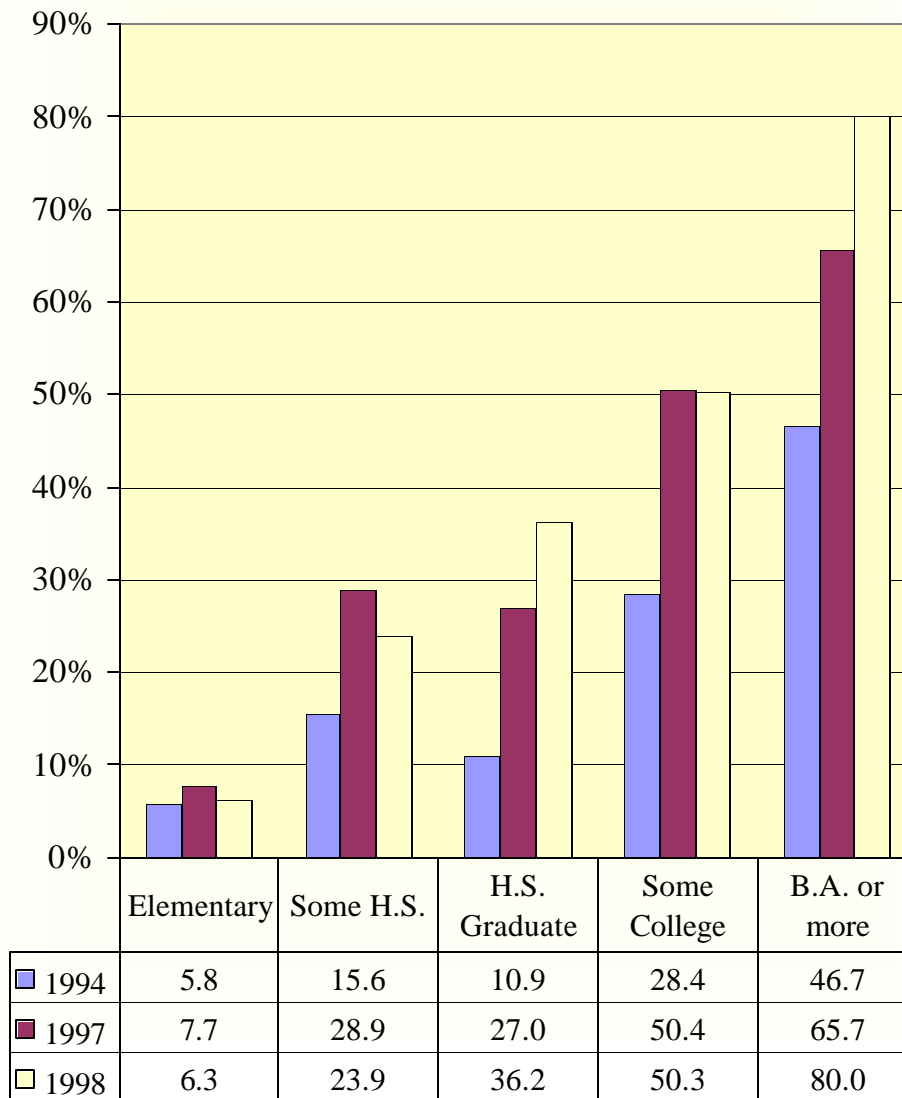
Tennessee Households Owning a Computer or Laptop By Location, By Year



Source: US Census Bureau

Table 22

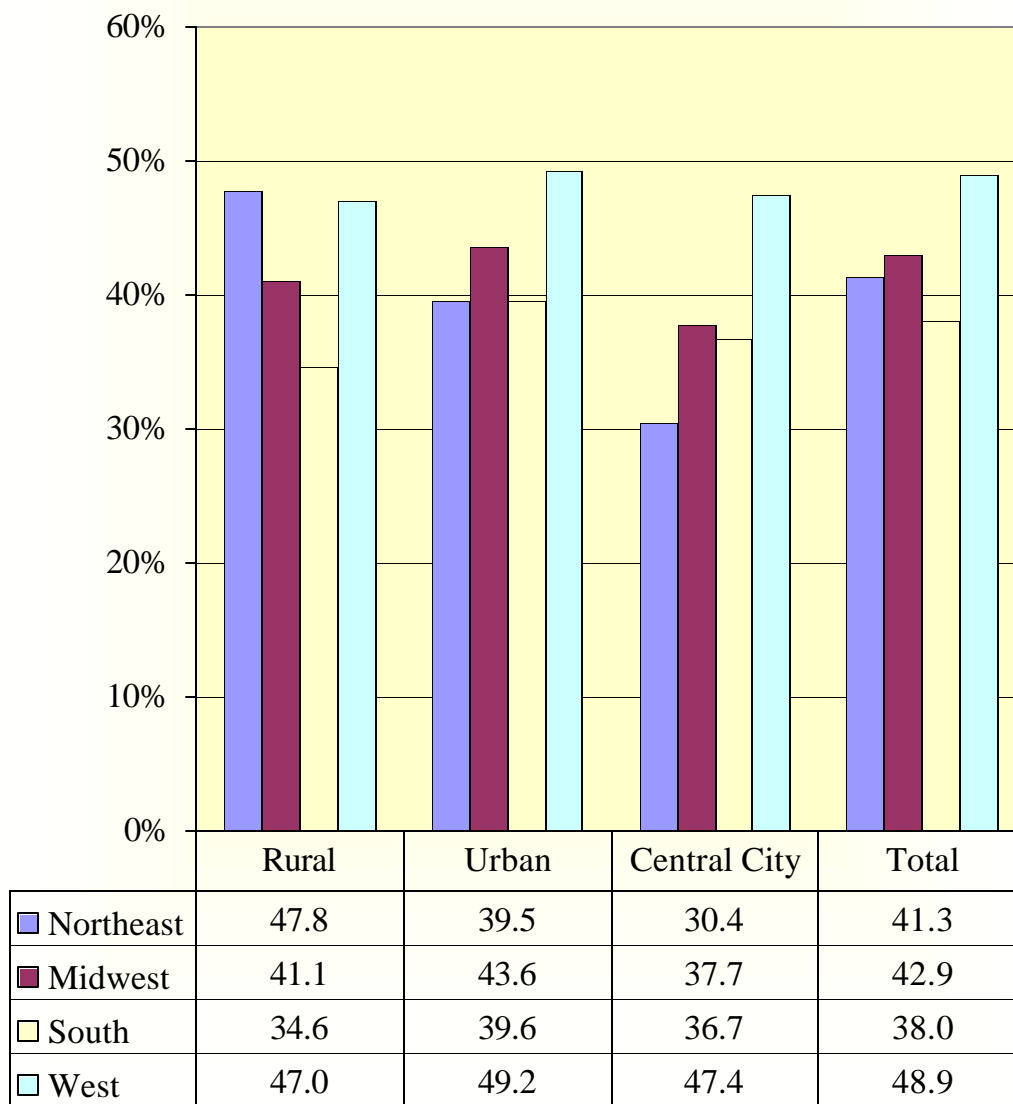
Tennessee Households Owning a Computer or Laptop By Education, By Year



Source: US Census Bureau

Table 23

U.S. Households Owning a Computer By Region Rural, Urban and Central City Areas



Source: US Census Bureau and NTIA, 1998

Table 24

Appendix B

Bridging the Gap Evaluation Report

October 20, 1999

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Acknowledgements

The development of this report was supported by grant number 27-60-97025 from the U.S. Department of Commerce Telecommunications and Information Infrastructure Assistance Program. Points of view or opinions expressed in the article are not necessarily those of the Department or Offices within it.

The project directors, Denise Griffith and Steve George provided access and assistance in data gathering. Penny Damlo expertly kept records and reports necessary to complete the evaluations. Trainers Andrew Baldwin and Eileen Abrahamson followed evaluation procedures and documented the many heartwarming events and challenges that occurred during the course of the project. Research assistance was provided by Carol Hayward. The students and their families graciously gave their time to ensure the project was evaluated and its impact recorded.

Overview

As technology becomes more commonplace, there is a growing awareness that not all segments of society have access to the technology needed to keep pace with the changing times. The disparity is most acutely apparent for students from wide ranges of socioeconomic backgrounds. While students from more affluent homes have use and access to computers and the Internet on a regular basis, those with fewer means must often rely on what is available within their school curriculum. The disparity between the two groups becomes larger and larger as those who have access to technology within their homes become more proficient at using the tools of the next century, and those without that access fall further behind.

Two Minneapolis-St. Paul Metropolitan Area suburban/rural school districts recognized the importance of providing technology within the homes to students whose economic circumstances prohibited such access. The project, called “Bridging the Gap”, was designed to reduce disparities between technological “haves” and “have-nots” by capitalizing on existing technological infrastructures and family advocacy programs/services in school districts to increase the technological skills and competencies of the students and their families. The United States Department of Commerce, through a Telecommunications and Information Infrastructure Assistance Program (TIAP) grant, funded the project. The project was implemented in August 1997 and was completed in August 1999.

The Bridging the Gap project is a shift from traditional training/support approaches because students and parents worked side-by-side in settings that facilitated their needs. Key to the theoretical framework guiding this project was access to computers within the home. Each family was provided with a state-of-the-art laptop computer for use during the project. Successful participation by students and their families resulted in ownership of the laptop computer. In addition, the project included collaboration among the business sector and public sector in providing the infrastructure for the project to work. **There were four strands to the project including the following:**

- Information Technology Training
- Family Computer Use and Parent/Child Interaction
- Linkages for Ongoing Support and Follow-up
- Large Scale Access Strategies

The project included an extensive evaluation effort. Several indicators of success were measured during the course of the project, including specific technology outcomes such as student and parent knowledge of software and increased use and interest in computers. Global outcomes such as student achievement, attendance and parent job opportunities were also measured.

Findings suggest that the project was highly successful and can serve as a model for “bridging the technology gap” by providing access and increased opportunities for parents and students who do not have the financial means to access technology or the understanding of the importance of technology to their children’s educational success.

Findings

Strand 1: Information Technologies Training included five desired outcome areas.

1. Student and parent joint participation in technology training;
2. Student knowledge and use of software;
3. Parent knowledge and use of software;
4. Student interest in computer technologies; and
5. Parent interest in computer technologies.

All outcome goals were achieved or exceeded, except for student and parent participation, which fell just short of the 90 percent training attendance goal. Findings and recommendations are given below. The training resulted in high interest, use, and knowledge of technology for both the students and their parents.

Student and Parent Joint Participation in Technology Training

- Eighty percent of families beginning the project completed the required 48 hours of training.

Increase Student Knowledge and Use of Software

- All students increased their computer competency during their participation in the project.
- Students increased their use of computers for schoolwork and other activities.

Increase Parent Knowledge and Use of Software

- At the onset of the project, parents reported considerably less comfort with computers and software than their children did. At the beginning of the project, only half of the parents were comfortable with basic computer and software manipulations, e.g. opening, closing and saving files. However, by the end of training, all parents reported improvement in their computer skills.
- Nearly all parents were interested in computers throughout the program and expressed importance of computers in their future learning activities and work environments. As training proceeded, parents' comfort increased.

Increase Students' Interest in Computer Technologies

- Nearly all students were interested in computers throughout the program and appeared eager to learn. Teachers reported a high level of motivation by the participants. Students increased their use of computers for schoolwork and other school-related activities.

Increase Parents' Interest in Computer Technologies

- Nearly all parents remained interested in computers throughout the program. Many reported that being involved in the project had changed their lives as they now felt they could compete with others in the work place. Parent participants were particularly articulate about how the project had affected their view of technology and education. They reported understanding the importance of computers in their children's education and were grateful for the opportunity to have one in the home.

The desired outcomes for Strand 2, Family Computer Use and Parent/Child Interaction were met or exceeded.

Increase Family Members Use Computers.

- All family members used computers for various school, work, or recreational tasks. There was more use by siblings than expected. This was a primary focus of the project. The goal was met and exceeded.

Increase Parent/Child Interaction.

- On average, weekly parent/child interaction time was nearly 3.5 hours per week, compared with a goal of 2 hours per week. Parents and students reported spending more time with each other in a positive environment. The children often served as teachers to the parents, changing the dynamic of the home. In addition, the child's position in the home was often elevated as they were the reason all members of the family had an opportunity to have a computer.

Global Outcomes

In addition to specific technology outcomes, global outcome areas were identified to investigate links with the project and other areas such as student achievement and parent work-related opportunities. The following desired outcomes were assessed.

For Students:

- Increased academic achievement;
- Improved attendance rates;
- Increased homework completion; and
- Increased use of media resources.

For Parents:

- Increased parent involvement in the schools;
- Decreased transiency; and
- Increased work-related opportunities.

While it is not possible to rigorously determine cause and effect of global outcome parameters due to limited data and the large number of variables, it is interesting to note trends in behaviors.

For Students

Increase Student Achievement.

The project was implemented in January 1998; consequently, academic data reflected one-half year of instruction. Additional academic data will be available in an addendum after fall 1999 test results are analyzed.

- Student achievement data from the Metropolitan Achievement Test-7th Edition were available for 60 percent of participating students. On average,

study participants made one year's growth in reading and math during the academic year, with slightly better performance in math. Students who began the project but did not complete it showed mixed results, with reading scores improving more than one year and math scores improving less than one year. All other students showed one year's growth, on average.

Increase Attendance Rates

- On average, project participant's absentee rates were similar to their non-participating grade peers.

Increase Homework Completion

- Survey findings suggest that participation in the project had a positive impact on homework completion for some students. Parents and students reported that access to computers and the Internet motivated them to do a better job. Parents perceived that students produced a more "quality product" with access to computers.

Increase Use of Media Resources

- Survey findings suggest students were using the computers more often and for more school-related tasks. Parents reported their children were watching television less and using computers more. Many reported an increase in knowledge-building use such as accessing websites related to the children's interests.

For Parents

Increase Parental Involvement in the Schools

- Principals reported many instances where parents who had been alienated from the schools were now participating in the volunteer programs or coming to school on a regular basis. In some cases, parents who had been openly hostile to the school and its personnel were asking to repay the school through volunteer work for the opportunity they had been given through the project.

Decrease Family Transiency

- Only four percent of the project participants moved out of the two districts involved in the project. Though there are little data to compare past mobility rates of this population, anecdotal data indicate that this is comparatively low. In addition, parents reported trying to find housing within one of the two school districts so they could continue with the project.

Increase Work-related Opportunities

- Most parents reported that the project increased their use of technology on the job and 25 percent reported changes to their job-related activities, including promotions.

Summary of Qualitative Findings

Focus groups were conducted with students, parents, and principals to assess project effectiveness in several areas. The most helpful aspects of the project were increased computer literacy and improvement in school and job skills. The greatest school-related difference in children was increased motivation to learn. Behavioral differences in children were primarily noted in their use of time, including decreased television viewing, replaced by time spent with the computer. Principals noted positive impacts on discipline. Parents felt their participation positively impacted their job performance and provided opportunities to consider new or different jobs. Principals also noted increased family involvement in school.

Parents and children reported increased time together as a result of the project. Teacher/student roles often reversed with parents and children. In a few cases, students felt their parents were spending too much time on the computer and not enough time with them.

Focus groups results suggest the project was highly successful in meeting desired outcomes with several positive unintended consequences.

Throughout the project parents articulated their strong feelings about the project and its effect on their families. In many cases, parents were in tears when describing the difference the project had made to their families. They explained what it felt like to be out of the mainstream in the technology area. They described the alienation of feeling that they may never understand what the rest of society was using and taking for granted. Parents discussed the difference it made for their children to be educated on a level-playing field, where their income did not make the difference to their children having an opportunity to learn like students who come from families with higher incomes.

Principals told of the difference in behavior for students involved in the project. At one school students come from apartment buildings where the residents are mostly low-income. She described the difference in conversation as the children came off

the bus; rather than discussing the sometimes-violent incidents of the previous evening, the students discussed the software they were using.

The children were equally as articulate in discussing the difference the project had made to their lives. They described how it felt to hand in projects that were not completed on word processors as many of their other classmates. They described increased self-esteem as they were now like all the other students.

Implications

The project was clearly a success in all areas in which it was evaluated. The impact of the project was even greater than hypothesized by the project designers. The depth to which parents and their children feel alienated and how this impacts their motivation to learn was clearly evident in the surveys and focus group findings.

Moving this type of program to large scale is critical if the technology gap is to be narrowed for many of the families in American society. The model implemented through Bridging the Gap can be used in school districts and communities throughout the country. There were several elements that are necessary for communities contemplating such a project.

1. The technology infrastructure must be in place within the school district to support the learning of the students and the parents.
2. A technology leader must be a champion of the concept and bring it to reality.
3. The business community must be on board providing the services at reduced or no cost to those without the financial means (Frontier Communication provided this for this project).
4. Training **MUST** accompany any home computer leasing or give-away project.
5. Students and parents should be involved together in the training.

With the reduced cost of computers comes the opportunity for communities to consider implementing this type of project. This project would not have occurred without the assistance of the federal government. Their role in replicating this type of project is critical to large-scale implementation. Though this is a small project, findings suggest the benefits to the children in their learning and motivation are large as well as the benefits to the parents, many of whom found increased work opportunities as a direct result of their

participation in the project. This is a project that deserves further consideration for large-scale implementation.

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